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An Economic Analysis Of The Pricing Efficiency And Market Organization Of The U.S. Grain Export System

By Dr. Neilson Chase Conklin

This analysis supplements GAO's staff study entitled "Market Structure And Pricing Efficiency of U.S. Grain Export System," GAO/CED-82-61.

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AN ECONOMIC ANALYSIS OF THE PRICING EFFICIENCY AND MARKET ORGANIZATION OF THE U.S. GRAIN EXPORT SYSTEM

CHAPTER 1

INTRODUCTION

The Problem

Exports of grains and oilseeds by the United States have grown spectacularly since the mid-1960's. During 1979 U.S. corn exports represented over 30 percent of domestic production. Exports of wheat and soybeans amounted to over 57 percent and 33 percent, respectively, of the national harvest. Grain and oilseeds exports are of great importance, not only to the agricultural sector, but also to the entire U.S. economy. During 1980 the total value of wheat, corn, and soybean exports was $20.8 billion, almost 10 percent of the value of all U.S. exports. Any inefficiencies in a system which moves such a substantial volume of trade are potentially very costly to society. This is the problem which this study seeks to address.

Public concern with the U.S. grain export system began with large sales to the Soviet Union in the early 1970's. The market dislocations accompanying what came to be known as the "great grain robbery" stimulated three government actions designed to prevent a reoccurrence of these events; (1) the 1973 agreement with the U.S.S.R. on cooperation on the field of information concerning Russian crop conditions, (2) the 1976 bilateral grain agreement stabilized Soviet purchases in the U.S. market, and (3) section 812 of

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the Agriculture and Consumer Protection Act of 1973 (P.L. 96-86) required exporters of designated agricultural commodities to report export sales to USDA on a weekly basis.

Problems also developed with the system of weighing and inspection of grain for export. Legislation was subsequently passed by Congress creating the Federal Grain Inspection Service in 1976. Other questions involving the U.S. grain export system have centered around its high degree of market concentration. It is generally assumed that a substantial share of U.S. grain exports is handled by a small number of large multinational corporations. This assumed oligopolistic market structure leads some observers to conclude that prices to grain producers are reduced.

In response to these perceived problems, bills have been introduced in the U.S. Congress calling for a greater direct role of the government in grain exporting (H.R. 4237, 96th Congress). How is the U.S. grain export system organized and how is it changing? How well does this marketing system perform? Policymakers and legislators need answers to these questions in order to make sound policy decisions.

Objectives

The purpose of this study is to resolve some of the unanswered questions about the U.S. grain export system. The four major objectives are: (1) to describe and analyze the organization of the U.S. grain export system; (2) to define some economic measures for perceived performance problems; (3) to conduct an empirical analysis using these measures; and (4) to evaluate the implications of the

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empirical results for the organization of the U.S. grain export system.

The U.S. grain export system is dynamic and has undergone major organizational changes in recent years. Cook Industries, once a major exporter, is no longer in the market. Farmer-owned cooperatives have increased their share of exports and large Japanese traders have penetrated the U.S. market in recent years. The number of exporting firms and their characteristics are not the only relevant measures of the industry's organization. Market institutions, such as futures markets and forward cash markets are also important, as are government policies, programs and regulations. No current studies of the organization of the U.S. grain export system and the relationships between firms, institutions, and government are available, therefore analysis of the system organization is a necessary task. The operation of grain export firms is also poorly documented. Since grain merchandising and risk management clearly involve the use of market institutions they have implications for market performance. Hence, an understanding of commercial practices is an essential part of this market analysis.

Lists of market performance criteria and measures are in plentiful supply. However, these measures are often of limited empirical use. Social interest in a market system (in an economic context) is in its performance, or how efficiently it fulfills its functions. These measures will be directed toward what are perceived to be major performance problems in the grain export system, especially the efficiency of price discovery mechanisms. The analysis of the U.S. grain export system's economic performance using

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these measures and the evaluation of empirical results are the final steps in this study.

Analytical Approach and Sources of Data

There is no single accepted methodology for the analysis of markets and their performance. The structure, conduct, performance (S.C.P.) approach, derived from industrial organization theory, has been the most commonly used technique of market analysis in recent years. This approach assumes causality between structure and performance. Factors such as high concentration ratios, barriers to entry and "excessive" advertising are said to imply suboptimal performance, i.e. a loss in consumer welfare due to monopolistic pricing or x inefficiencies. S.C.P. studies tend to concentrate on structure and macro performance measures while the firm and micro aspects of performance are given less attention. On the other hand advocates of the coordinating approach to market analysis emphasize the micro aspects of market performance. This methodology suggests the derivation of micro performance measures from neoclassical economic theory while the organization of industry is regarded as an outcome of its micro performance.

Practitioners of the above schools of thought often arrive at widely divergent conclusions concerning various markets and their performance. This has led policymakers and the public to regard economists with justifiable suspicion. The analytical approach used in this study is an eclectic one. The institutional structure of the U.S. grain export system does affect its performance. The government policy environment, a part of this structure, even specifies some social performance goals in the form of

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regulations. Thus the organization of the grain export system must be taken into account in carrying out market analysis. At the same time economic performance measures must be clearly specified and soundly based in economic theory.

Performance criteria derived from economic theory include productive efficiency, technological progressiveness, and pricing efficiency. Productive efficiency involves the choice of the correct technology, the operation of firms at the optimal size or scale, and the full utlization of available facilities. These are the static aspects of productive efficiency. In a dynamic world, productive efficiency depends upon technological progress. Theory suggests that technological change should be directed toward saving the scarce input.

Productive efficiency has not been viewed as a major problem in the grain export system. However, major performance problems have been perceived in the system's pricing efficiency. Allegations have generally centered around central market pricing, and especially the futures markets. Critics of the system have contended that due to market structure there is a significant lag between the time export sales are made and the adjustment of market prices, enabling major exporters to profit on insider information. Since economic theory suggests that prices in an efficient market fully reflect current information this allegation implies informational inefficiency of price discovery mechanisms. Therefore, the analysis of pricing efficiency in the grain marketing system is a particular test of the efficient market hypothesis.

Information concerning the organization of the grain export system was collected from a variety of government

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and industry sources. This information was synthesized and analyzed to provide a clear picture of the complex and dynamic system which moves U.S. grain overseas. A series of structured interviews with selected grain exporting firms provided information concerning market operations and risk management in grain exporting. The informational efficiency of the price discovery mechanism is evaluated using time series techniques including regression analysis and spectral analysis. Data for the analysis came from CFTC and USDA sources.

Questions to be Answered

This study seeks to answer some of the questions raised about the organization and performance of the U.S. grain export system. Three specific questions are addressed.

1. How is the U.S. grain export system organized and how has it evolved over time?

2. Do central market prices accurately reflect current information with respect to grain exports?

3. What are the implications of central market pricing efficiency for industry organization?

The ensuing chapters are devoted to answering these questions.

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CHAPTER 2

THE PROBLEM SETTING AND REVIEW OF LITERATURE

Grain Export Policy

Concerns over grains and grain trading probably predate recorded history. Both ancient Greece and Rome imported wheat from their colonies and Socrates remarked that ". . . no man qualifies as a statesman who is entirely ignorant of the problems of wheat." David Ricardo's investigation into the effects of the British Corn Laws, a prohibitive tariff on grain imports, was the beginning of a rich body of economic literature concerning international grain trade. An excellent review of this literature may be found in Johnson, Grennes and Thursby.

During the past decade international grain markets have displayed increasing instability. This instability has resulted from the increasingly close balance in the demand and supply of grain, the lack of large government held reserves, and the emergence of the centrally planned economies as large and sporadic customers on the world market. The resulting swings in grain prices have caused problems for producers and consumers around the world. Governments have attempted to deal with these problems using a variety of policy tools. Most importers and exporters, other than the United States, insulate their domestic markets by the use of levies, tariffs, quotas, or state controlled import and export agencies. Table 2.1 briefly summarizes the types of trade policies used by major grain trading nations in the wheat, corn, and soybean

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Table 2.1 Trade Policies in Wheat, Corn, and Soybean Markets1/

Nation	Trade Policy		
	Wheat	Corn	Soybeans
EEC-9	Variable levy to maintain domestic price, export subsidies for soft wheat	Variable levy to maintain domestic price	Free trade
Eastern Europe	State trading, imports determined by domestic production and targets	State trading, imports determined by domestic production and targets	State trading, imports determined by domestic production and targets
USSR	State trading with formal bilateral agreements	State trading with formal bilateral agreements	State trading with formal bilateral agreements
Japan	State trading with fixed domestic resale price	Free trade	Free trade
LDC's	Generally use State trading agencies	Generally use State trading agencies	Generally use State trading agencies
Brazil	State trading	N/A	Exporting quotas and licensing
Canada	Wheat board controls exports	N/A	N/A
Australia	Wheat board controls exports	N/A	N/A
Argentina	Free trade	Free trade	N/A

1/ Cathy L. Jabara, Trade Restrictions in International Grain and Oilseed Markets. Foreign Agricultural Economic Report 162, USDA ESS, Jan. 1981.

The United States has not consistently followed a policy of insulating its domestic from foreign grain markets. However, embargoes have been imposed on grain and oilseed exports on an ad hoc basis during periods of tight supplies as well as for political reasons. This free trade type policy has meant that U.S. producers and consumers have been faced with adjustments to shocks in the world grain markets. Producer groups have felt that prices have been too low, consumer groups have thought them too high and both groups have been distressed by price instability.

The traditional response by the United States to these problems has been to pursue multilateral trade negotiations such as the International Grains Arrangement. These have been generally unsuccessful. In light of these problems Hathaway outlines some policy issues for the United States.

> "We also have some emerging policy issues here at home. If I am correct in my assertions that protectionism, market adjustment and market stabilization are major trade issues for the U.S. during the 1980's, several policy questions become evident. There will be a continuing need in the United States for a market stability mechanism like the farmer reserve. The changes which are occurring are complex and the policy responses and their full range of consequences have not been completely thought out. The answers are not simple. Among the proposed solutions which we must deal with are grain boards, bilateral agreements, and dual or multi-pricing schemes." (Hathaway, p. 5).

There have been numerous proposals for changes in U.S. grain export policy, some of them are simplistic, such as a bushel for a barrel, however, many are serious. The Weaver bill (H.R. 4237, 96th Congress) proposed the creation of a grain marketing board to obtain the highest export prices for American farmers. Richard Gilmore has proposed a food

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bank system. This food bank would accumulate grain reserves, license grain exporters and channel food aid abroad. Morgan (1980) proposes a grain reserve board. Groenewegen and Cochrane develop a detailed stabilization program for the American grain sector. This program would be based on a variable export levy, a reserve program and a series of bilateral agreements to allocate U.S. export grain.

All of these proposals to change U.S. grain export policy involve some degree of change in the U.S. grain export marketing system. The system is currently one of private enterprise subject to some government regulation. The policy proposals reviewed above would all increase direct government involvement in the export system. In general, the government would become not only a regulator of, but also an active participant in, the grain export system.

Our present grain export system, however, is at best poorly understood. Most analysts dealing with grain export policy problems pass over the role of the export marketing system with a sentence or two, while advocating changes that may have serious implications for the organization and performance of this system.

The Grain Export System

The U.S. domestic grain market is linked to the world market by the grain export system. The flow chart in Figure 2.1 portrays the relationship of the U.S. grain export system to world and domestic markets. Grain flows from the farm to country elevators to inland terminals. From inland terminals it moves either into domestic use or

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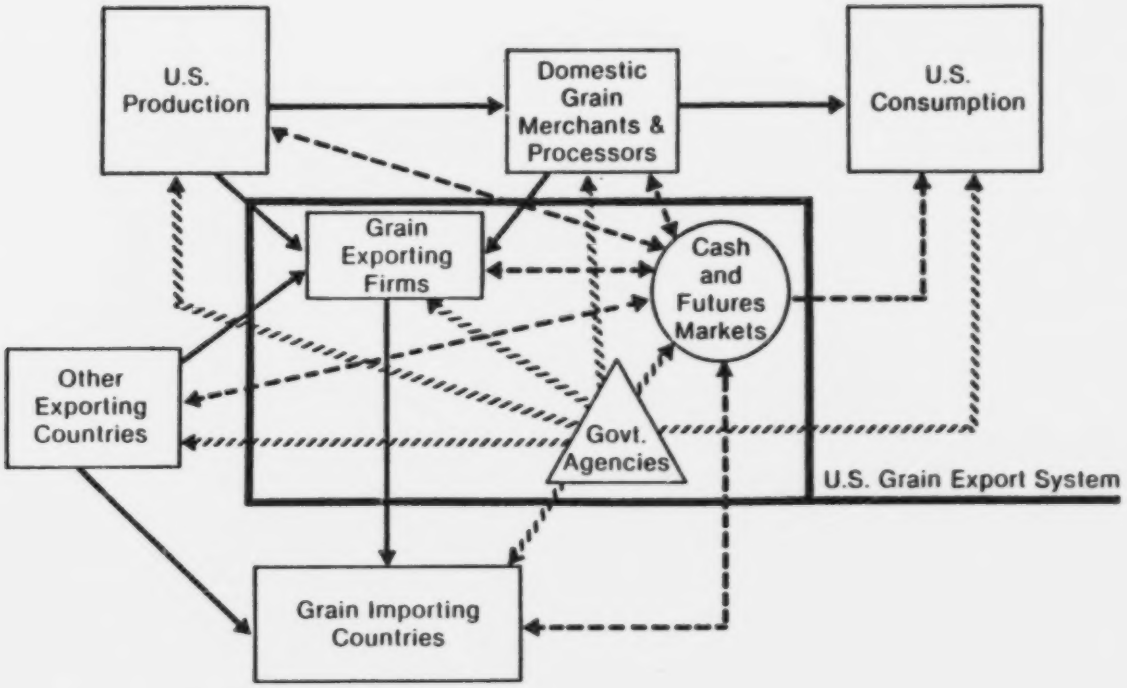
Figure 2.1 The U.S. Grain Export System in the World Grain Market



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into the export channel. For the purposes of this study, grain enters the export system once it is out of position for domestic use.

The U.S. grain export system consists of grain exporting firms, market institutions and government agencies, which both facilitate and regulate grain exports. For the purposes of this study a grain exporter is defined as a firm which directly sells grain to an importer. These sales are usually f.o.b., c. & f. or c.i.f.1/ Grain trading firms may be roughly categorized into three groups; major multinational corporations, cooperatives, and other exporters. Major multinational corporations include Cargill, Continental, Dreyfus, Bunge, and Garnac. These firms operate globally and handle much of the grain sold by exporting nations other than the United States. Farmer-owned cooperatives have a significant share of U.S. grain exports. The largest of these is Farmer's Export Company. Other exporters include smaller U.S. firms which trade mainly in the domestic market and Japanese trading houses such as Mitsui. Five major multinational companies are generally assumed to handle a major part of U.S. grain exports. This perceived high degree of concentration in the industry combined with the recent instability in world grain markets has led to mistrust and suspicion of the grain export system. However, this market is a dynamic one, and its structure has undergone rapid changes in recent years. Cook Industries, once a major grain exporter, is no longer a significant force in the market.

1/ These are contract delivery terms. f.o.b. (free on board) means the grain is loaded on board ship at the export elevator. Under a c.i.f. (cost, insurance, freight) or c. & f. (cost and freight) sale the exporter delivers grain to the importer's destination.

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Export facilities previously owned by Cook have been acquired by cooperatives and Japanese firms, thus increasing their share of U.S. grain exports.

While the private sector moves the grain several government agencies are directly involved in the regulation of the U.S. grain export system. The federal grain inspection service is responsible for the inspection and weighing of export grain. Grain export sales are reported to the USDA and futures markets are regulated by the CFTC. However, the government also plays a major role in facilitating grain exports through the export development wing of the Foreign Agricultural Service and the provision of aid for grain purchases through P.L. 480 and G.S.M. credit programs. Many more government programs and regulations impinge less directly on the grain export system.

The primary functions of the U.S. grain export system are to sell grain to overseas customers and to deliver the proper grade, at the right time and place. In general terms these are the same functions fulfilled by any marketing system, to provide utility of time, place, and form. A less obvious and equally important function of a marketing system is to provide economic signals in the form of prices. The U.S. grain export system provides price signals to farmers, domestic consumers, and to importers. Prices have a dual role within this system. First they serve as signals to allocate resources and second they distribute economic returns to participants in the system. The market institutions, where these price signals are generated, are therefore an important part of the U.S. grain export system.

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Market institutions within the U.S. grain export system include futures markets and cash markets. Futures markets provide a central price discovery mechanism, not only for the domestic, but also for the world grain market. Futures markets, becoming increasingly important to the international grain trade, are used by both buyers and sellers around the world as a price reference as well as a means of transferring price risks to others willing to bear them. Cash grain markets are more decentralized than futures markets and cash transactions are usually based upon futures price quotations.

These market institutions tie the entire grain export system together and link it to world and domestic markets. In aggregate the grain export system is a complex network encompassing flows of both grain and information. It involves the private firms, the public sector, and market institutions. The overall system is at best poorly understood by most people outside it and even many insiders have a limited perspective. Perhaps this is why there is such a small body of literature concerning the grain export system.

Review of Literature

The international grain trade literature has, generally neglected import and export marketing systems. It has also ignored the role of private firms in the international grain markets. The literature on export marketing systems is extremely thin. Juillerate and Farris described organization and facilities of the U.S. grain export industry in 1968. Their study concentrated on elevator capacity and the flow of grain to export position. Congressional interest in the U.S. grain export system during the early 1970's

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resulted in a GAO report (ID-76-61) on export marketing systems in Argentina, Australia, Canada, and Brazil. The report describes the historical background and institutional structure of these marketing systems. Another comparative study was carried out by Schmitz and McCalla. Their analysis concludes that the U.S. and Canadian grain export systems are unique products of individual historical development and that comparisons of performance are difficult to make. Wilson and Anderson describe the Canadian grain export system and discuss performance measures for the system, including: price level, price stability, and market access. They conclude that while performance of the Canadian export marketing system appeared to be lagging behind the U.S. system, the differences in performance could not be attributed to the marketing board system used by Canada.

Caves (1977) examined the economic performance of the U.S. grain trading industry including the export system, using a market structure, conduct, performance approach. He attributed the high level of concentration in the export industry to economies of scale in risk bearing and coordinating information. However, he also pointed out some unique aspects of U.S. grain trading which mitigate the effects of concentration, including the presence of farmer-owned cooperatives and futures markets. A 1976 Farmers Cooperatives Service Study (Thurston et al.) on improving the export capability of cooperatives attempted to deduce concentration ratios for the U.S. grain export industry. Eighty-five percent of U.S. grain exports were attributed to the five largest firms.

A General Accounting Office report (ID-76-87) on issues surrounding the management of grain exports examined

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problems associated with the export reporting system. The report also found that during 1974 the seven largest exporting firms accounted for 62 percent of total sales of wheat, corn, rice, soybean, cottonseed, soybean oil, cake, and meal. Heifner, Kahl, and Deaton examined the effect of large grain export sales on U.S. futures market prices. They reported that futures price increases and decreases both occurred during export sale periods, and that exporting firms experienced both gains and losses on futures market transactions during these periods.

Thompson and Dahl directly analyzed the performance of the grain export industry. They concentrated on the spatial aspect of pricing efficiency and found that corn prices were highly correlated throughout the export channel. They concluded that the U.S. grain export industry displayed efficient pricing performance within its spatial dimension. McCalla (1980) notes that this is not a complete test of pricing efficiency. The productive efficiency of the U.S. grain export system was addressed in a qualitative analysis. Economies of scale in transportation, risk bearing and information coordination were hypothesized.

Levine examined the role of information in the pricing of grain exports. His findings indicate that grain export firms gather information from a wide variety of sources. While their own networks of traders and agents are important they also make extensive use of public information. These firms also maintain full-time research departments. Levine's interviews indicate that export firms incur large fixed costs for their information systems. Some of the firms interviewed by Levine indicated a reluctance to eliminate any source of information regardless of cost.

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This would indicate a relatively high return to information in grain exporting.

Martin (1979, 1980) hypothesizes that government policy, structure and conduct all interact with performance in a simultaneous fashion. He then suggests that government policy should be considered explicitly and that performance should be the starting point for analysis of grain marketing systems. Using this approach Martin defines a list of performance objectives desired by market participants in the grain sector. These include supply stability, equitable distribution of income, incentives for increased productivity, maximize foreign exchange earnings, etc. From these objectives performance indicators and quantifiable measures are developed.

Cook and Wilson describe the Argentinian grain export system and develop performance criteria and measures for the system using a methodology similar to that outlined by Martin. Rossen and Cook examine the Australian system within a similar framework. These papers propose a general and comprehensive methodology for dealing with export marketing system performance. Their definition of the export marketing system is extremely broad encompassing production as well as the entire marketing chain. Five performance criteria are proposed for the analysis of grain export marketing systems: Technical efficiency, price efficiency, export response, progressiveness, and equity. These authors suggest a three-step process for the evaluation of export system performance: (1) disaggregated performance analysis, (2) specify some social objective function and the resulting norms, and (3) use comparative studies to measure how close a system approaches these norms.

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Martin's (1979) suggestion that structure, conduct, policy and performance form a simultaneous system, seems to be an attractive foundation for analysis of the U.S. grain export system. Unfortunately, it does not appear possible to rigorously model such a system. The ad hoc specification of a series of performance objectives and measures (Martin, 1980; Cook and Wilson, Rossen and Cook) does not seem to be a suitable solution to this problem. This study takes an alternative approach, in an attempt to capture the complex simultaneous relationships involved in the U.S. grain export system.

The Plan of the Study

The first step in this analysis is a detailed description of the organization of the U.S. grain export system found in Chapter 3. The structure of the private sector, the role of market institutions, and government regulation are all considered. The critical performance issue of central market pricing efficiency emerges from this analysis. A methodological approach for market performance analysis is developed in Chapter 4, and specific pricing efficiency criteria for the U.S. grain export system are defined in Chapter 5. The empirical analysis of price behavior in the U.S. grain export system and the relationships between pricing efficiency and system organization are presented in Chapter 6. The first step on this analytical path is to examine the complex and changing organization of the U.S. grain export system.

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References - Chapter 2

Caves, Richard. "Organization, Scale and Performance in the Grain Trade," Food Research Institutes Studies, Vol. 16, No. 3 (1977-78).

Cook, Michael L. and Wilson, Shasi. "Methodological Issues in Examining Export Market Performance: The Argentinian Case." Paper presented at the AAEA annual meetings, Urbana, Illinois, 1980.

Gilmore, Richard. "Grain in the Bank." Foreign Policy, No. 38, Spring 1980, pp. 168-181.

Groenewegen, J.R. and Cochrane, W.W. "A Proposal to Further Increase the Stability of the American Grain Sector," American Journal of Agr. Econ., Vol. 62, Nov. 1980, pp. 806-811.

Hathaway, Dale. "Trade and Development Issues for the 1980's." Presented at the 1981 Agricultural Outlook Conference Session No. 34, Nov. 19, 1980.

Heifner, Richard, Kahl, Kandice and Deaton, Larry. "A Study of Relationships Between Large Export Sales and Futures Trading." Appendix to Export Grain Sales. Hearing before the Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business. House 96th Congress, 1st session. June 11, 1979.

Jabara, Cathy L. Trade Restrictions in International Grain and Oilseed Markets. Foreign Agricultural Economic Report 162, USDA ESS, Jan. 1981.

Juillerate, Monte E. and Farris, Paul L. Grain Export Industry Organization and Facilities in the United States. Research Progress Report 390. Lafayette, Ind.: Purdue University, Agricultural Experiment Station, 1971.

Levine, Mark B. The Use of Information for the Price Determination of Grains for Export. Ph.D. Dissertation, Cornell University, 1976.

Martin, Larry J. "Comparing Performance of Alternative Marketing System: A Suggested Approach With Special Reference to the Grain Markets of Canada and the United States." Paper presented at NC-139 technical meeting, Moscow, Idaho, August 1979.

BEST DOCUMENT AVAILABLE

Martin, Larry J. "Comparing International Market Performance: Conceptual and Measurement Issues." Paper presented at the AAEA annual meetings, Urbana, Illinois, July 1980.

McCalla, Alex F. Discussion of papers presented at the American Agricultural Economics Association meetings, Urbana, Illinois, 1980.

Morgan, Dan. "The Politics of Grain." The Atlantic 264, July 1980, pp. 29-34.

Rosson, C. Parr, III and Cook, Michael L. "Methodological Issues in Examining Export Market Performance: The Australian Case." A paper presented at the AAEA annual meetings, Urbana, Illinois, 1980.

Schmitz, Andrew and McCalla, Alex F. "Grain Marketing Systems: The Case of the United States Versus Canada," American Journal of Agr. Econ., Vol. 61, No. 2, May 1979, pp. 199-212.

Thompson, Sarahelen R. and Dahl, Reynold P. The Economic Performance of the U.S. Grain Export Industry. Tech. Bulletin 324, St. Paul, Minnesota, Agricultural Experiment Station, University of Minnesota, 1979.

Thurston, Stanley K., Phillips, Michael J., Haskell, James E. and Volkin, David. Improving the Export Capability of Grain Cooperatives, FCS-34. Farmer Cooperatives Service, USDA, Washington, D.C.: U.S. Government Printing Office, 1976.

U.S. General Accounting Office. Grain Marketing Systems in Argentina, Australia, Canada, and the European Economic Community: Soybean Marketing System in Brazil. ID-76-61, 1976.

U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports. Report to the Congress, ID-76-87, May 2, 1977.

Wilson, W.W. and Anderson, D.E. "The Canadian Grain Marketing System." A paper presented at American Agricultural Economics Association annual meetings, Urbana, Illinois, 1980.

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CHAPTER 3

THE CHANGING ORGANIZATION OF THE U.S. GRAIN EXPORT SYSTEM

The public, academics, and policymakers have a generally poor understanding of the U.S. grain export system, its organization and its functions. Before 1972, there was little reason for anyone outside the grain trade to give it much thought; world grain markets were relatively stable and U.S. food prices low. In the wake of major grain purchases by the U.S.S.R. in 1972 and rapid food price increases, public attention was focused on grain exports and the firms that moved them. In this politically charged atmosphere many popular misconceptions about the export industry arose and the traditional secretiveness of the export firms did not contribute to their elimination. The following quotation exemplifies public perception of the grain export system through the lens of the press:

> "The five companies [Cargill, Continental, Bunge, Dreyfus and Cook] maintain a strangle hold over the world's grain supply and constitute a food cartel unprecedented in world history. The grain companies are not at the mercy of the free market.
>
> On the contrary, they use their enormous size to manipulate the free marketplace and to maximize profits at the expense of farmer and consumer alike." (Burbach, p. 25).

Two popular conceptions about the export industry are embodied in this quotation: First that a few major export companies constitute a cartel or shared monopoly over grain exports, and second that they are able to manipulate market price without restraint. Additionally the public has been

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led to believe that the government exercises no control over the export system. This perception is revealed in Dan Morgan's statement: "Yet the [grain] companies still were rogue elephants in the international economy, as large, central, and almost as unaccountable as ever, . . ." (Morgan, p. 361). The purpose of, this chapter is to examine the basis for these popular conceptions of the grain export system and to provide a framework for an objective analysis of the system's performance.

An Overview of the Export System

The physical function of the U.S. grain export system is to move grain to export position where it can be loaded on ocean going vessels for delivery to foreign customers. The correct types and grades of grain must be made available at the time they are needed. Over the last decade the volume of grain and oilseeds moving through this system has increased dramatically as shown in Table 3.1. Wheat exports increased by 105 percent, corn by 328 percent and soybeans by 82 percent during this period. This increased grain movement has been accommodated by the grain export system, although not without problems. Rail car shortages, rail line abandonments, inadequate lock and dam capacities and rural road deterioration have plagued the grain transportation network (GAO, CED-81-59).

The general pattern of grain movement from farm to ocean vessel is shown in Figure 3.1. Grain flows to various port areas in response to shifts in foreign demand, ocean freight rates, and the costs of interior transportation. Grain is moved by truck from the farm to a country elevator or to a subterminal. From these locations it is moved by truck or rail to a river terminal, an inland

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Table 3.1 U.S. Exports of Wheat, Corn and Soybeans1/
1970-1980 (1,000 MT)

Year	Wheat	Corn	Soybeans
1970	17436	14384	11955
1971	16220	12871	11538
1972	21317	22357	11996
1973	37444	33144	13221
1974	25132	29801	13940
1975	30966	33442	12496
1976	26527	44264	15332
1977	23826	40415	16196
1978	34096	50043	20705
1979	33378	59167	20888
1980	35750	63042	21779

1/ USDA, ESS - U.S. Foreign Agricultural Trade Statistical Report, Calendar year 1980. Washington, D.C., May 1981.

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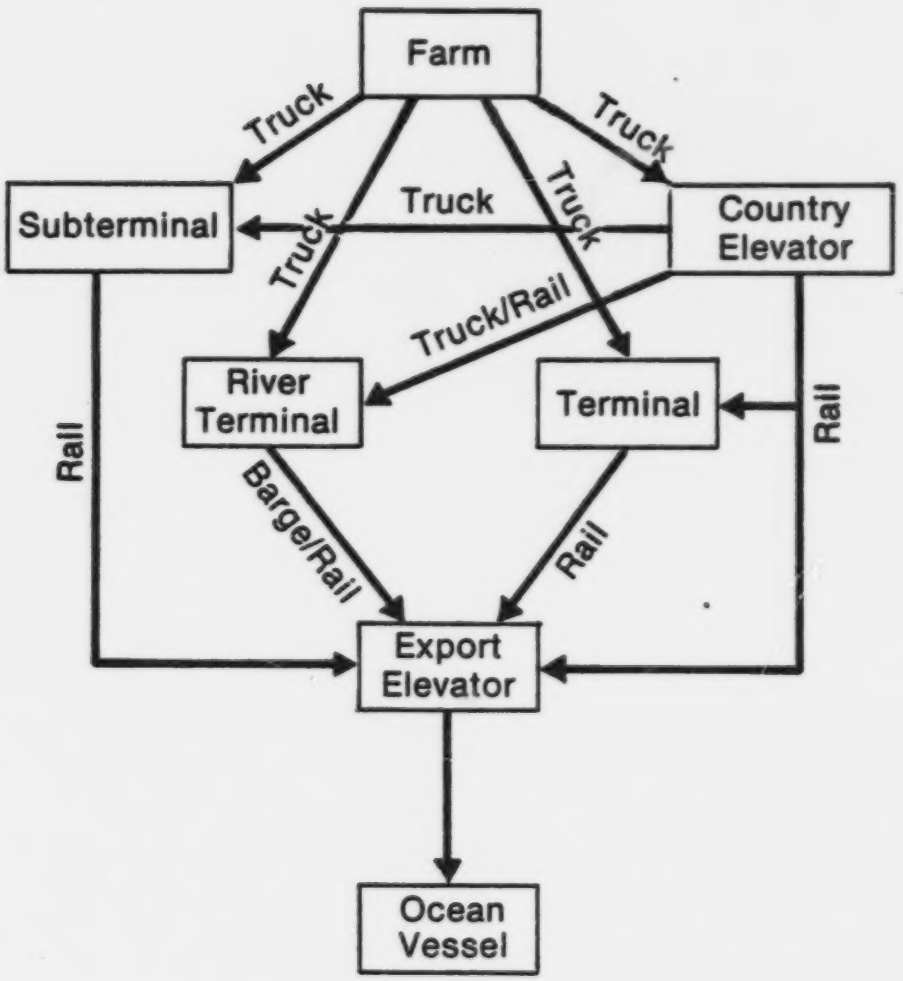
Figure 3.1 Grain Movement From Farm to Port Elevator



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terminal or directly to an export elevator. Grain from river and inland terminals moves by barge and rail to export elevators, where it is loaded on ocean vessels. In recent years, grain has increasingly bypassed the terminal elevators as subterminal facilities have developed and even country elevators have developed the capacity to load unit trains. This development has been accelerated by the increasing development of new rates for unit trains and deregulation of the transportation industry under the Staggers Act.

The movement of physical grain does not occur automatically, nor is it achieved at the direction of a "grain czar." Under the private enterprise system of the United States, grain movements are generally directed by private sector decision makers in response to economic forces. Farmers, domestic merchandisers and processors, grain exporters, transportation companies and other enterprises interact, buying, selling, and moving grain to its ultimate destination. Since the early 1970's the public sector has not been directly involved in grain marketing activities until the embargo of grain sales to the U.S.S.R. in January of 1980. However, the public sector continues to play an important role in the grain export system. In its policy-making role, government attempts to define socially acceptable limits for the system. These limits are manifested in a broad range of policies including: Food and agriculture, health and safety, environmental, transportation, and foreign relations. The regulatory function of the government is to keep the system operating within the parameters set by these policies.

Neither private nor public decision makers act in a vacuum; they require information in order to do their jobs.

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Although it is less visible than the physical movement of grain, the flow of information is just as important to the grain export system. Information concerning the physical state of the system, changes in economic variables and the policy environment is necessary. Specialized information entrepreneurs, in both public and private sectors, have emerged to provide this information. Wire services, government agencies, trade publications and newsletters regularly provide information about grain prices, stocks, exports and crop conditions. Additionally they provide outlooks, forecasts and analyses which may be useful for making decisions affecting activities in future time periods.

Although information entrepreneurs speed the flow of information to decision makers, they are not at the heart of information flow in the grain export system. Large volumes of general information are not useful to decision makers unless they are processed into easily interpreted signals. In the case of the grain export system, economic signals in the form of prices are generated by the interaction of buyers and sellers in the market. Organized commodity markets which facilitate cash and futures trading have evolved to provide well organized price discovery and reporting mechanisms. Grain futures markets are especially important as a central reference point, facilitating cash grain trading for both spot and future delivery. Thus the efficiency of these market institutions in translating information about grain export sales into price changes is crucial to the performance of the entire system. The U.S. grain export system is complex, involving three important components: (1) grain exporting firms, (2) the market institutions through which they interact, and (3) the public sector which regulates both firms and market

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institutions. The balance of this chapter is devoted to an analysis of these three components of the system.

Market Structure of the Grain Export Industry

Perhaps the most prevalent conception about the system is that grain exports are controlled almost exclusively by a few major multinational corporations. There are five major multinational corporations currently exporting grain from the United States; Cargill, Continental, Bunge, Louis Dreyfus, and Garnac (an affiliate of Swiss based Andre). However, there are a multitude of other firms exporting American grain; including farmer-owned cooperatives, Japanese trading houses, flour milling firms and numerous smaller firms. While some of these firms lack the capability of exporting a full range of commodities to all destinations, it would be a mistake to assume that they do not play a role in the competitiveness of the industry.

Before considering the structure of the grain export industry, the definition of a grain export firm must be considered. Is the firm that loads ocean vessels an exporter? What about the firm that actually contacted the foreign buyer and made the sale? Or must the bonafide exporter perform both of these activities? For the purposes of this study a grain export firm is defined as a firm that sells grain to a foreign buyer. This definition includes firms that may not appear as the shipper on export documentation. This is the basic definition of a reporting exporter used by the Foreign Agricultural Service of the USDA. This definition excludes firms owning port elevators but not making sales to overseas customers. Moreover, any individual making a grain sale to a foreign customer is counted as an exporter. By this definition, the Export

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Sales Reporting Division of the F.A.S. estimates that during the 1980-81 marketing year approximately 100 firms reported grain exports, on a non-duplicated basis.

While the number of firms engaged in the business of exporting grain is relatively large, not all of them export a full range of commodities and products. Using data collected in a survey of 195 agricultural export firms the U.S. General Accounting Office (ID-76-87) classified these firms by primary commodity groups. The results presented in Table 3.2 give a better idea of the distribution of exporting firms among commodity groups.

Although the evidence above indicates that a substantial number of the firms are engaged in the grain export business, the industry is in fact a relatively concentrated one. It is, however, less concentrated than public perceptions and some research publications have led us to believe. A 1976 report by the Farmer Cooperative Service by USDA estimated that the six largest grain export firms, Cargill, Continental, Bunge, Dreyfus, Cook and Garnac, controlled 90 percent of the U.S. grain export market (Thurston et al., p. 16). However, concentration ratios calculated by the Sales Monitoring Branch, Foreign Agriculture Service (Wright and Krause) for market year 1974-75 tell a different story. As shown in Table 3.3, the largest eight firms accounted for 68.8 percent of total food grain, feed grain, oilseed, and oilseed product exports. Concentration is somewhat greater in food grains exports than in feed grains or oilseeds. It is only at the twenty firm level, that concentration ratios approach 90 percent.

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Table 3.2 Agricultural Export Firms Classified by Primary Commodity 1973-74[1]/

Primary Commodity	Number
Multi Commodity	27
Soybeans and Products	34
Wheat and Products	22
Corn	17
Cotton and Products	54
Rice	26
Inactive	15
Total	195

1/ U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports, Vol. II, ID-76-87, May 2, 1977, p. 43.

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Table 3.3 Cumulative Concentration Ratios of Exporting Firms and Total Exports, Marketing Year 1974-75[1]/

Exporting Firms	Food Grains[2]/	Feed Grains[3]/	Oilseeds and Products[4]/	Total
Four largest	58.3%	43.6%	41.6%	48.6%
Eight largest	77.8%	64.0%	62.7%	68.8%
Twenty largest	87.9%	93.2%	87.3%	90.1%

1/ Bruce H. Wright and Kenneth R. Krause, "Foreign Direct Investment in the U.S. Grain Trade," Report to the Congress: Foreign Direct Investment in the United States, Vol. 4, Appendix E, U.S. Department of Commerce, April 1976, p. E-13.

2/ Wheat, rye and rice.

3/ Corn, barley, oats and sorghum.

4/ Soybeans, soybean oil, cake and meal, cottonseed oil, cottonseed cake and meal, linseed oil and flaxseed.

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Table 3.4 Cumulative Concentration Ratios of Exporting Firms and Total Exports of Wheat, Corn and Soybeans, Marketing Year 1974-75[1/]

Exporting Firms	Wheat	Corn	Soybeans
Four largest	61.0%	42.0%	40.5%
Eight largest	81.7%	63.8%	63.7%
Twenty largest	89.2%	93.3%	90.8%

1/ Bruce H. Wright and Kenneth R. Krause, "Foreign Direct Investment in the U.S. Grain Trade," Report to the Congress: Foreign Direct Investment in the United States, Vol. 4, Appendix E, U.S. Department of Commerce, April 1976, p. E-14.

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Concentration ratios for the export of wheat, corn and soybeans, shown in Table 3.4, indicate levels comparable to those for the commodity groups presented above. The highest degree of concentration occurs in the wheat export trade where the top eight firms control 81.7 percent of the market, while both the corn and soybean markets have eight firm concentration ratios of around 63 percent.

Concentration ratios for export firms alone do not adequately reflect the effective degree of competition in the grain export industry. Grain exporters must compete with domestic merchandisers and processors for supplies of grain. The domestic grain industry in the United States is much less concentrated than the export industry, where the largest twenty firms controlled only 54.5 percent of total sales in 1977, as shown in Table 3.5. While concentration may be higher within specific regions, the existence of alternative marketing channels between regions makes the national market an appropriate unit of inquiry for a trading industry like grain merchandising (Caves, 1977, p. 3).

Caves also points out that "any effective market control, which would have to include the ability to limit or exclude entrants, must rest on the control of physical facilities." (Caves, 1977, pp. 2-3). Furthermore, this control must be at a critical node where transshipment between transportation modes is required. The increased bypassing of terminal elevators in the grain export system leaves the port elevator as the appropriate unit for consideration of this proposition. Although there are firms owning export facilities, which do not make grain sales to foreign customers, and there are exporters who do not own any physical facilities, the control of export facilities

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Table 3.5 Cumulative Concentration Ratios of Firms Wholesaling Grain, 1977[1]/

Firms	Percent of Total Sales
Four largest	25.4%
Eight largest	38.1%
Twenty largest	54.5%

1/ U.S. Department of Commerce, Census of Wholesale Trade, 1977, Subject Series, Establishment Size and Firm Size, Bureau of Census, 1980, p. 152.

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facilities does increase the flexibility and power of a firm in the export system.

Since two earlier studies (Thompson and Dahl; Juillerate and Farris) reported on concentration of port elevator capacity, and data for 1981 was readily available from the Federal Grain Inspection Service, control of port elevator storage capacity in 1968, 1976 and 1981 is presented in Table 3.6. Although the data for all three years are not strictly comparable they do appear to be reasonably consistent.

Trends in the control of port elevator storage capacity over the last decade do not reveal increases in concentration. The total storage capacity held by major exporters has declined. This decline probably resulted from the phasing out of obsolete facilities, and the construction of new elevators with higher loadout rates requiring less storage capacity. In 1968 the major exporters controlled 56.2 percent of storage capacity; this share shrank to 54.1 percent in 1976 and 50.3 percent in 1981. During this same time period, cooperative elevator capacity increased dramatically from 9.7 to 21.4 percent of total export elevator storage capacity. This growth was especially apparent at gulf ports where coops owned no elevators in 1968 and six in 1981. The share of elevator ownership by firms other than cooperatives and major exporters has declined during the last decade. Thus it would appear that cooperatives have been gaining in control of export facilities at the expense of both smaller private firms and the major exporters. While the recent difficulties experienced by the major interregional cooperative, Farmers Export, may slow this growth it seems unlikely that

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Table 3.6 Control of Port Elevator Storage Capacity Area 1968, 1976 and 1981[1/]

Port Area	Major Exporters[2/]			Cooperatives			Others			Total		
	1968[3/]	1976[4/]	1981[5/]	1968	1976	1981	1968	1976	1981	1968	1976	1981
	Capacity (mil. bu.)											
Great Lakes	97.3	64.5	69.6	26.0	19.0	34.0	40.4	45.1	40.2	163.7	128.6	148.8
Atlantic	18.5	28.4	26.3	4.0	0	7.3	5.0	4.4	5.8	27.5	32.8	39.4
Gulf	45.1	47.4	57.8	0	11.8	30.8	54.9	33.9	33.7	100	93.1	122.3
Pacific	35.8	26.8	25.5	4.1	4.2	4.0	18.8	23.2	20.9	58.7	54.2	50.4
Total	196.7	167.1	179.2	34.1	34.9	76.1	119.1	106.6	100.6	349.9	308.7	355.9
	Percent of Total Capacity											
Great Lakes	59.4%	50.2%	48.4%	15.9%	14.8%	23.6%	24.7%	35.0%	28.0%	100%	100%	100%
Atlantic	67.3%	86.5%	66.7%	14.5%	0	18.5%	18.2%	13.5%	14.7%	100%	100%	100%
Gulf	45.1%	51.0%	47.3%	0	12.7%	25.2%	54.9%	36.3%	27.6%	100%	100%	100%
Pacific	61.0%	49.4%	50.6%	7.0%	7.7%	7.9%	32%	42.9%	41.5%	100%	100%	100%
Total	56.2%	54.1%	50.3%	9.7%	11.3%	21.4%	34%	34.6%	28.3%	100%	100%	100%

1/ Note: The 1968, 1976 and 1981 data are not strictly comparable. The 1981 data should be regarded as the most comprehensive and consistent since they were obtained by direct survey. Sources including USDA ASCS approved warehouse lists and various trade directories were used to compile the data for 1968 and 1976.

2/ 1968 figures include Bunge, Cargill, Continental, Dreyfus, ADM and Peavy. 1976 figures include Cargill, Continental, Bunge, Dreyfus and Cook. 1981 figures include Bunge, Cargill, Continental, Dreyfus and Garnac.

3/ Monte E. Juillerate and Paul L. Farris, Grain Export Industry Organization and Facilities in the United States, Research Progress Department 390, Purdue University, Agricultural Experiment Station, Lafayette, Ind., August 1971, p. 6.

4/ Sarahelen R. Thompson and Reynold P. Dahl, The Economic Performance of the U.S. Grain Export Industry, Tech. Bulletin 352, University of Minnesota, Agricultural Experiment Station, St. Paul, Minn., 1979, p. 21.

5/ Compiled from USDA, FGIS Export Elevator List, 1981.

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the share of port storage capacity owned by cooperatives will decrease.

While overall export elevator ownership patterns have remained remarkably stable during the 1970's, firms have both entered and left the industry since 1968. For example, Cook Industries appears in the list of major exporters for 1976 (Table 3.6) but not for 1968 or 1981. The rapid rise and equally rapid demise of Cook is illustrative of the fact that barriers to entry in the grain export industry are not absolute.

Economic theory suggests that freedom of entry and exit may be a more important indicator of an industry's competitiveness than concentration ratios. Although relatively large economies of size have been hypothesized as a barrier to entry in grain exporting (Caves, 1977; Thurston et al.), members of the grain trade have pointed out that there are widely varying sizes at which a firm may enter the export business. Small firms may find an initial niche by providing a special service, product, or quality of grain.1/ Once established the firm may expand.

Although empirical evidence on the changing composition of the industry is limited, the available data suggests that over time new firms have been able to enter the export business. A General Accounting Office survey of agricultural commodity exporters (ID-76-87) gives some idea of entry patterns in the industry during the last century. The responses of 175 exporters about the year their firm

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1/ This means of entry into the grain export business was mentioned during an interview with the International Grain Management Corporation, a small exporter and consulting firm, on May 15, 1981.

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entered the industry are shown in Table 3.7. During the five years 1971 to 1975 over 21 percent of the 175 firms responding to this question entered the agricultural export business. Undoubtedly, these new entrants were attracted by the rapid expansion of U.S. export demand during this period. The steady rate of entry into the export business from 1951 to 1975 does not indicate serious barriers to entry.

Additional evidence on the entrance of firms into the grain export business is available for the 1975 to 1980 period from the Export Sales Reporting Division of USDA's Foreign Agriculture Service. As shown in Table 3.8, firms reporting export sales of wheat increased by over 30 percent, reporting corn and soybean exporters by 37.5 and 15.4 percent, respectively.

A series of interviews with selected grain exporters1/ revealed a general perception of increasing competition2/ in the industry over the last decade. This perception seems consistent with the data presented above. In addition to quantitative changes in the number of firms in the grain export business the results of these interviews suggest qualitative changes in the structure of the grain export industry. Japanese trading houses such as Marubeni, Mitsui, Mitsubishi, and C-Ito have assumed a greater role

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1/ Representatives of Cargill, Continental, Louis Dreyfus, Marubeni, C-Ito and International Grain Management were interviewed to obtain qualitative background information concerning the export industry, its structure and operation. The guideline used for these interviews appears in Appendix 1.

2/ For the industry "competition" has a meaning closer to rivalrous competition than to the economic meaning of the word.

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Table 3.7 Entry Into the Agricultural Export2/ Business 1880-19751/

Period Entered Export Industry	Number of Firms	Percent
1880-1925	19	10.9
1926-1950	39	22.3
1951-1960	42	24.0
1961-1970	38	21.7
1971-1975	37	21.1
Total	175	100.0

1/ U.S. General Accounting Office, Report to the Congress: Issues Surrounding the Management of Agricultural Exports, ID-78-87, Vol. II, May 1977, p. 39.

2/ This includes firms exporting soybeans and products, wheat and products, corn, cotton and products and rice.

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Table 3.8 Firms Reporting Export Sales of Wheat, Corn and Soybeans during Marketing Years 1974-75 to 1979-80[1/]

Year	Wheat	Corn	Soybeans
74-75	41	56	39
75-76	44	55	42
76-77	39	61	37
77-78	44	56	41
78-79	50	61	44
79-80	54	77	45

1/ Data provided by Export Sales Reporting Division, Foreign Agricultural Service, USDA.

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in exporting U.S. grain to countries other than Japan. Some of these firms have also acquired U.S. facilities including country elevators, terminals, and port elevators.

> "Another group of new entrants is best typified by Philipp Brothers, a division of Engelhard Minerals and Chemicals . . . it is applying its expertise developed in merchandising other commodities (e.g. metals, ores and petroleum) to the business of exporting U.S. grain." (Middents, p. 4).

Farmer-owned cooperatives have also assumed an increased role in the export system. From 1968 to 1981 their share of total port elevator storage capacity increased from 9.7 percent to 21.4 percent (Table 3.6). Over the years cooperatives have also been increasingly aggressive in selling their grain directly to foreign customers. The recent difficulties of Farmers Export Co., an interregional cooperative may indicate some changes in the role of cooperatives in the grain export system. Recent developments (including the sale of Farmers Exports' Galveston Elevator to one of its member regionals, Farmarco) indicate that regional cooperatives will increasingly compete directly for export business.

Thus, although market concentration is substantial in the grain export industry it does not appear to be increasing over time. Patterns of export facility ownership are relatively stable with concentration in the hands of major exporters declining slightly. The substantial increases in the number of firms reporting exports indicate freedom of entry into the industry and potential increases in competition. Additionally, exporters must compete for grain supplies with domestic merchants and processors and the domestic market is not a highly concentrated one. An

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additional factor which may provide increased competitiveness in the grain export system is the existence of highly liquid futures markets for the major export grains (Caves, 1977). These market institutions provide a central location for price discovery, where barriers to entry are low, and trading takes place under rules and regulations designed to insure competitiveness. The next part of this chapter is devoted to the crucial role of these institutions in the U.S. grain export system.

Market Institutions

A market may be defined as a sphere of economic activity in which profit maximizing firms interact with each other and with utility maximizing consumers and price discovery takes place (Cochrane, 1957). This concept of the market is amorphous; it does not require a specific place, time or rules. Under this concept the corn market, for example, might encompass all transactions involving the purchase or sale of corn during a given time period. Over the years man has developed numerous institutions to facilitate the operation of the market. Medieval fairs, the village marketplace and futures markets are all examples of such institutions.

Futures markets1/ provide a place and a set of rules under which price discovery, not only for the current period but for future time periods, may take place. The role of the futures markets in the U.S. grain export system

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1/ The following discussion of futures markets is based in large part on a publication by Neilson C. Conklin, Gerhard Wilbert and Reynold P. Dahl, "Pricing of Grain Exports and the Role of Futures Markets," Minnesota Agricultural Economist, No. 614, Agricultural Extension Service, University of Minnesota, 1979.

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is an important one. U.S. futures markets provide a worldwide price reference for buyers and sellers, a means for shifting price risks to those willing to bear them and an efficient mechanism for the forward pricing of grain.1/

One of the more significant developments in the U.S. market economy has been the sizable increase in futures trading in grain and grain products during recent years. Futures trading volumes in grain and grain products has grown from 5.8 million contracts in 1970 to over 23.1 million contracts in 1978 (Table 3.9). The most important factor in the increased volume of futures trading in grain and grain products is the wider price fluctuation in these commodities since 1972 when worldwide shortages became evident. This increased price variability, stock carrying by private firms rather than the government, and increased export volume have increased the need for hedging.

Open contracts are the number of futures contracts that have not yet been offset by opposite futures transactions or fulfilled by delivery of the commodity. Open contracts are better indicators of hedging activity than is the total volume of trading. Average month-end open contracts have increased rapidly during the 1970's--from 160,000 in 1970 to more than 400,000 in 1978 (Table 3.9). For every open contract there is a buyer (long) who has agreed to take delivery and a seller (short) who has agreed to make delivery. Viewing typical buyers and sellers helps to ascertain the importance of hedging on both the long and short sides of the market.

1/ The use of futures markets for the forward pricing and hedging of export sales is discussed in detail in Appendix 2.

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Table 3.9 Number of Futures Contracts Traded and Average Month-end Open Interest in Grain and Grain Products1/ on All U.S. Futures Markets

Fiscal Year	Number of Contracts Traded	Average Month-ended Open Contracts
	1,000's	
1960	2,552	82
1970	5,839	160
1974	11,891	218
1975	13,298	226
1976	16,096	292
TQ2/	5,042	352
1977	20,128	362
1978	23,102	402
1979	--	--
1980	--	--

1/ Includes wheat, corn, oats, soybeans, soybean meal, and soybean oil. Wheat, corn, soybeans, and oats are computed at 5,000-bushel contracts. Source: CFTC.

2/ Transition quarter. The three-month period (July, August, September) of change when the federal fiscal year became October 1 to September 30 instead of July 1 to June 30.

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Looking at the distribution of the open contracts on the long side of the corn futures market shows that large hedgers (holders of futures positions of more than 200,000 bushels of grain) increased in importance from 30 percent of the open contracts in 1966-67 to nearly 80 percent in 1975-76 (Figure 3.2). Some of the small traders who hold long open contracts are also hedgers, but it is not possible to ascertain how many. The larger proportion of long open contracts held by hedgers reflects the growth in corn exports.

Increases in grain export sales result in an increase in long hedging because most export sales are made with cash forward contracts. This means that grain to be delivered anywhere in from 1-6 months or more is sold and priced at the same time. If a flat price is fixed when these forward sales are made, the exporter assumes a flat price risk. This is the risk that the price of grain sold will increase before the exporter can purchase it. But, this price risk can be lessened by purchasing futures contracts, which serve as temporary substitutes for the cash grain until it is purchased. If it were not for futures markets, exporters would have to assume this risk or pass it along to the importer by charging a higher price. This substantial risk premium would reduce the volume of exports.

U.S. futures markets are increasingly being used by the rest of the world both for hedging and price reference. Importers of U.S. grain, both private firms, government agencies, and even exporting nations, make use of U.S. futures market prices. Many observers feel that the Canadian Wheat Board keeps a close watch on U.S. futures markets. Thailand has used U.S. futures market prices as

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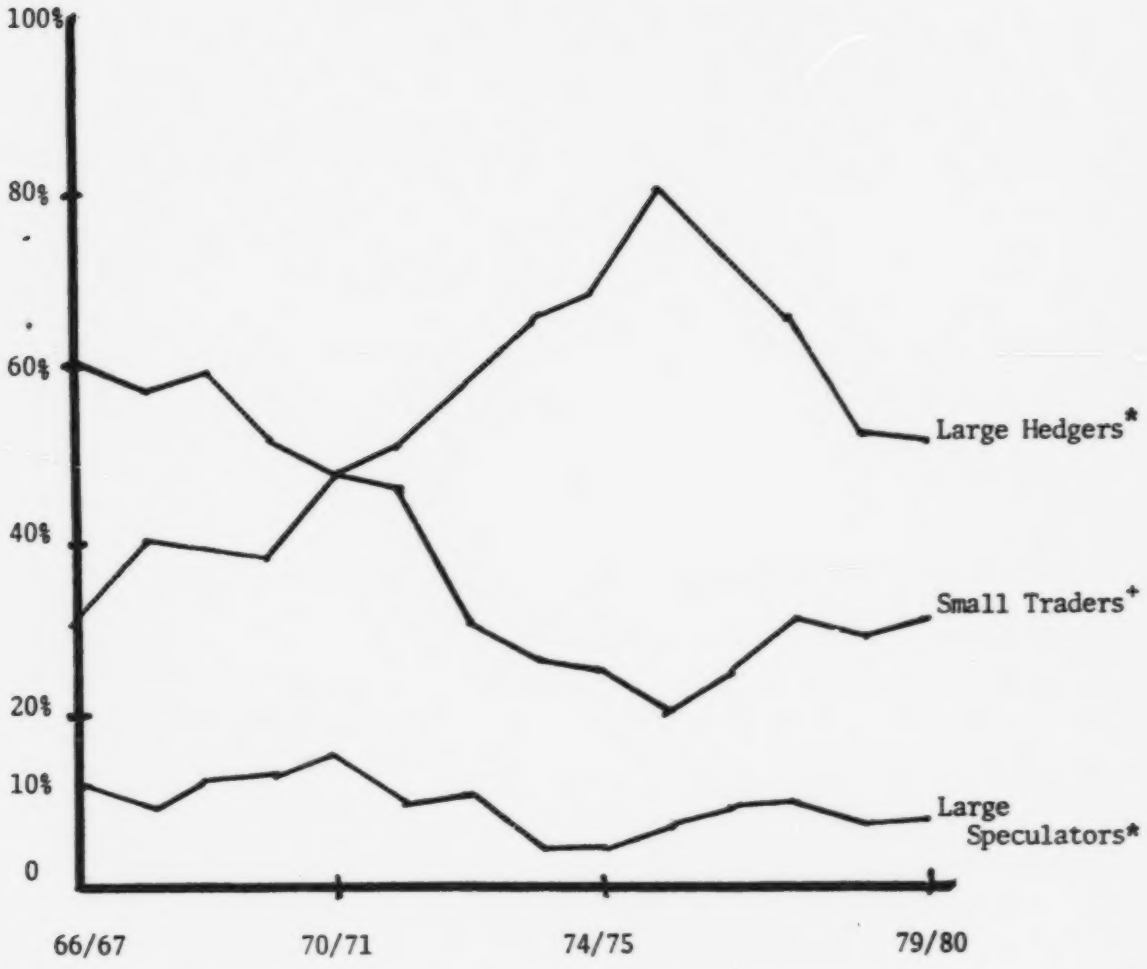
Figure 3.2

Corn futures: the percent of long month-end open interest held by types of traders, 1966 to 1980 crop years 1/



1/ Source: CFTC.

* Holding more than 200,000 bushels.
+ Holding less than 200,000 bushels.

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part of the export price formulas in its bilateral corn export agreements with Japan and Taiwan.

Futures markets, becoming increasingly important to the international grain trade, are used by both buyers and sellers around the world as a price reference as well as a means of transferring price risks to others willing to bear them. However, futures markets are not the only important market institutions in the U.S. grain export system. Cash markets, both spot and forward, also play an important role. On spot cash markets grains are bought and sold for current delivery. These are the markets where much of the grain being moved through the export system changes hands. On the other hand much grain is also sold for forward delivery.

Forward cash markets differ from futures markets in that prices are generally specified rather than discovered by auction. Additionally a forward cash contract is generally settled by full performance of both parties while futures contracts are not generally settled by delivery. Forward cash markets under certain circumstances may also provide price discovery mechanisms and facilitate risk transfer. Today in the U.S. grain export system there are two forward cash markets which offer these opportunities, the c.i.f. barge market at the gulf ports and the foreign resellers market.1/

The foreign resellers market is not a formal institution; rather, it consists of grain purchases and sales

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1/ The author wishes to acknowledge indebtedness to Robert Kohlmeyer of Cargill who provided much information about the operation of these markets during an interview on June 18, 1981.

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taking place around the world, often via telex or tele phone. This market has been referred to as the "private commodity exchange" of the major grain companies (Morgan, p. 208). During the early 1970's the principal location for this market was at the Milan grain exchange in Italy. The principal reason for this seems to have been the presence of major Italian speculators who offered the market some liquidity.

The resellers market offered an opportunity to make large volume (shipload) transactions without the margin requirements and other regulations of U.S. futures markets. This market became "a kind of futures market embryo" (Kohlmeyer) since grain was traded at a fixed price and a standard set of terms and usage began to develop. The rapid development of this unregulated market could be of major concern to the U.S. grain export system, if it became large enough. However in the aftermath of a series of defaults and bankruptcies in 1974 and 1975 (Morgan, pp. 210-211; Kohlmeyer) the "Italian market" began to lose some of its appeal. The risks of participating in this unregulated market were too great.

However, a resellers market still exists today and does offer trading opportunities. Unfortunately, the massive body of data on prices and volumes available for U.S. futures markets is not available for this decentralized informal institution. Data on purchases of U.S. produced commodities from foreign sellers is available from 1975-1980, and represents a proxy for the volume of transactions in the international resellers market. The volume of these transactions is significant, as shown in Table 3.10, averaging over 4.8 million metric tons per year for corn. Wheat, barley and soybean volumes are somewhat lower.

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Table 3.10 Total Purchases of U.S. Produced Commodities by Foreign Sellers1/ (1,000 MT)

Market Year	Commodity			
	Wheat	Barley	Corn	Soybeans
1975-76	1639.4	98.4	5295.2	2361.1
1976-77	2700.6	459.8	4267.1	4384.8
1977-78	2206.6	162.0	3510.6	3921.7
1978-79	1312.8	111.2	5139.5	4530.1
1979-80	1856.4	132.7	6119.8	4479.9
Average	1943.2	192.8	4866.4	3935.5

1/ USDA - FAS U.S. Export Sales. A weekly publication 1975-1980. A purchase from a foreign seller is a contract to buy a U.S. produced commodity from a firm outside the U.S.--not involving a cancellation or buyback of a reported sale.

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The significance of these absolute volume of transactions is limited. The important factor is whether or not these transactions represent a significant percentage of total U.S. exports (Table 3.11) at a given time. These percentages are shown for market years 1975-76 to 1979-80 for wheat, barley, corn and soybeans in Table 3.12. The average percent of total exports represented by purchases from foreign sellers during this period ranges from a low of 6.5 percent for wheat to a high of 20.4 percent for soybeans.

The international resellers market appears to be relatively insignificant for wheat and corn. However, the barley and soybean markets appear to be somewhat more important. The fact that there is no active U.S. futures contract for barley may be one reason why this market is more active. Perhaps the reason for greater activity in soybeans is due to the lower international barriers to trade (levies, tariffs and quotas) for this commodity.

The c.i.f. barge market at U.S. gulf ports is very different from the international resellers market. While it too is a forward cash market, the bulk of the grain traded on this market is basis priced (Kohlmeyer). The participants in this market are generally grain merchandisers, such as barge loaders or exporters, rather than speculators. Since most trading on the c.i.f. barge market is basis Chicago futures it is not useful in hedging flat price risk.

The St. Louis call sessions at the Merchants Exchange of St. Louis offer a central location for the trading of barges c.i.f. New Orleans. Multi car units of rail corn and barge freight units are also traded on this market.

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Table 3.11 Exports of Wheat, Barley, Corn and Soybeans, Marketing Years 1975-76 to 1979-80[1/] (1,000 m.t.)

Market Year	Wheat	Barley	Corn	Soybeans
1975-76	29,402.1	503.3	43,976.5	15,904.3
1976-77	24,206.3	1,525.1	43,809.5	16,293.1
1977-78	28,811.1	1,169.2	49,212.1	19,074.2
1978-79	30,703.4	498.4	54,343.4	20,756.7
1979-80	35,357.1	1,059.6	62,714.4	24,485.4
Average	29,716.0	951.1	50,811.2	19,302.7

1/ USDA, Foreign Agricultural Service. U.S. Exports of Reported Agricultural Commodities for 1975-76 - 1979-80 Marketing Years, Export Sales Reporting Division, April 1981, p. 181.

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Table 3.12 Total Purchases of U.S. Produced Commodities from Foreign Sellers as a Percent of Exports, Marketing Years 1975-76 to 1979-80[1/]

Market Year	Wheat	Barley	Corn	Soybeans
1975-76	5.6%	19.6%	12.0%	14.8%
1976-77	11.2%	30.1%	9.7%	26.9%
1977-78	7.7%	13.9%	7.1%	20.6%
1978-79	4.3%	22.3%	9.5%	21.8%
1979-80	5.3%	12.5%	9.8%	23.2%
Average	6.5%	20.3%	9.6%	20.4%

1/ Calculated from Tables 3.10 and 3.11.

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The volume of trading in c.i.f. barge units for wheat, corn and soybeans is shown in Table 3.13. Trading in this market is most active in corn and soybeans, since these commodities are the most important in the Mississippi export channel. With a total volume of over 5 million bushels the St. Louis call session is a market institution of growing importance to the U.S. grain export system.

The network of market institutions in the U.S. grain export system including cash and futures markets, are as vital to the flow of grain as trucks, railcars, barges and elevators. It is through these institutions that information about supply and demand is revealed in the form of prices. These prices then serve to allocate the grain over time and space by signalling opportunities for arbitrage. The U.S. grain export system, unlike the centralized marketing systems of the U.S.S.R. and many other nations, accomplishes this feat without the direct involvement of the government. However, the government does play an important role in regulating these markets and the entire system.

Government Role in the U.S. Grain Export System

Thus far this study has dealt mainly with the role of private decision makers in the U.S. grain export systems and the market institutions through which they interact. The government also plays an important role in the system through policy formulation and regulation. Ever since the early 1970's the U.S. government has generally adopted a free trade, free market oriented policy toward grain exports. There have been exceptions to this general policy, including export embargoes (for both short supply and foreign policy reasons), and the negotiation of

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Table 3.13 St. Louis Call Sessions Volume in c.i.f. New Orleans Barge Units[1]/ and 1980[2]/

	Number of Units	
	1979	1980
Wheat	9	10
Corn	6,003	9,380
Soybeans	523	1,288
Total	6,535	10,678

1/ A barge unit of grain is approximately 50,000 bu.

2/ Merchants Exchange of St. Louis, 1980 Annual Report, p. 14.

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bilateral grain agreements with the U.S.S.R., the Peoples Republic of China and Mexico.

The debate as to whether or not this is an optimal policy regime is an ongoing one. However, this debate has generally been oriented toward the macro level, evaluating policy alternatives in terms of price levels, stability and farm income. It is important to note that major changes in this environment, such as the creation of a grain marketing board, would have profound implications at the micro level in the functioning of the grain export system. The functioning of price discovery mechanisms, such as futures markets, under such a regime has yet to be explored.

General policies established by the government pertaining to health and safety, the environment, transportation, and the economy also affect the grain marketing system. Health, safety, and environmental policies mandate the internalizing of costs otherwise external to the firm. These policies have the effect of increasing costs to the industry. The general trend toward the deregulation of transportation has stimulated innovations in rate making and grain transportation, which may result in increased efficiency within the grain marketing system. The number of government programs which affect the grain export system in one way or another is difficult to determine. However, using a computerized inventory of Federal food, nutrition and agricultural programs, developed by the U.S. General Accounting Office (CED-79-125) in cooperation with the Department of Agriculture and the Office of Management and Budget, over 50 programs potentially affecting the U.S. grain export system were identified. These programs include export and promotion programs such as P.L. 480 as well as regulatory activities.

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The day-to-day impact of the government on the grain export system is not as evident in its policy making as in its "regulatory" role. The regulatory role of government is not a strictly adversary one. For example, the provision of an independent grain inspection agency benefits the industry. In addition to the inspection of grain for export, the government regulates market institutions within the system. The Commodity Futures Trading Commission is charged with this responsibility.

Perhaps the most controversial attempt by the government to regulate the grain export system has been the requirement that all export sales of certain agricultural commodities, including the major grains and oilseeds, be reported to USDA. This reporting requirement was passed in 1973 as a result of the market dislocations in the early 1970's. The evolution of this system is described in a General Accounting Office report (ID-76-87). The objectives of the system are defined as follows:

> "The law does not provide explicit objectives for the export sales reporting system. A careful analysis of the legislative history also fails to reveal specific objectives for the system. But a review does suggest the following implicit objectives:
>
> (1) To provide information for the government for the development of export policies and programs.
>
> (2) To provide producers with information to help in their marketing decisions.
>
> (3) To improve performance of U.S. commodity markets by making public, timely information on export sales transactions." (U.S. Congress Export Grain Sales Hearing, June 11, 1979).

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The first objective of the system is relatively clear. The second objective is quite meaningless, since most grain producers will not be able to effectively use this type of information. However, the third objective is crucial to the welfare of producers; they can make effective use of commodity market prices in making marketing decisions. Therefore, it is of concern that these markets do reflect information concerning export sales in a timely manner. This is critical to the overall performance of the grain export system.

The involvement of the government in the grain export system is intimate, although indirect. The areas of the system affected by government programs and regulations are so broad, that they cannot all be considered in this study. The export sales reporting system, however, is directly related to the pricing efficiency of the export system and must be considered in the analysis of the system's performance.

Summary

The U.S. grain export system is a complex one involving flows of information as well as large volumes of grain. As a consequence it is, at best, poorly understood by the public and most policymakers and academics. This lack of understanding has fostered three common conceptions about the system:

(1) It is controlled by five major multinational corporations.

(2) These firms are able to manipulate markets and prices.

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(3) The government has no effective control over the system.

A careful examination of the market structure of the grain export industry reveals that the first conception is in fact a misconception; concentration levels are much lower than generally assumed. Additionally, evidence indicates that entry into the industry has occurred during the last decade, providing a further stimulus to effective competition.

The existence of liquid futures markets for the major grains does not automatically rule out all possibility of price manipulation. However, the existence of these market institutions is important to the competitiveness of the system. The existence of government regulation and information provision, in the form of the export sales reporting system and the CFTC, also has an effect on the system's performance. Government checks on the system do exist.

The second and third conceptions cannot be dismissed based on this analysis of market organization. These are performance issues. The existence of liquid futures markets and government regulatory agencies in the U.S. grain export system may be expected to improve market performance, however, they do not provide any direct evidence. A methodology for obtaining empirical evidence about the performance of the U.S. grain export system is developed in the next chapter.

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References - Chapter 3

Burbach, Roger. "The Great Grain Robbery," The Progressive, July 1976, pp. 24-27.

Caves, Richard. "Organization, Scale and Performance in the Grain Trade," Food Research Institutes Studies, Vol. 16, No. 3, 1977-78.

Cochrane, Willard W. "The Market as a Unit of Inquiry in Agricultural Economics Research," JFE, Feb. 1957.

Juillerate, Monte E. and Farris, Paul L. Grain Export Industry Organization and Facilities in the United States. Research Progress Report 390. Lafayette, Ind.: Purdue University, Agricultural Experiment Station, 1971.

Kohlmeyer, Robert W. Cargill, Inc. Interview, June 18, 1981.

Morgan, Dan. Merchants of Grain. New York: Viking Press, 1979.

Thompson, Sarahelen R. and Dahl, Reynold P. The Economic Performance of the U.S. Grain Export Industry. Tech. Bulletin 325, St. Paul, Minnesota, Agricultural Experiment Station, University of Minnesota, 1979.

Thurston, Stanley K., Phillips, Michael J., Haskell, James E. and Volkin, David. Improving the Export Capability of Grain Cooperatives, FCS-34. Farmer Cooperative Service, USDA, Washington, D.C.: U.S. Government Printing Office, 1976.

U.S. General Accounting Office. U.S. Grain Transportation Network Needs System Perspective To Meet Future Needs, CED-81-59, April 8, 1981.

U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports. Report to the Congress, ID-76-87, May 2, 1977.

U.S. General Accounting Office. Inventory of Federal Food, Nutrition and Agriculture Programs, CED-79-125, Sept. 11, 1979.

BEST DOCUMENT AVAILABLE

Wright, Bruce H. and Krause, Kenneth R. "Foreign Direct Investment in the U.S. Grain Trade," Report to the Congress: Foreign Direct Investment in the United States, Vol. 4, Appendix E, U.S. Department of Commerce, April 1976.

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CHAPTER 4

METHODOLOGY

Marketing and Market Performance

The process of marketing involves the creation of utility of time, space, form, and possession utility. Steiner points out that society has traditionally placed a higher value on form utility than the utility of place, time, and possession. This has resulted in a widespread cultural bias that farmers and craftsmen are good, while merchants are evil and slippery characters. Academic researchers, as well as the general public, often have a weak grasp of the concepts of time, space, and possession utility. Past approaches to agricultural marketing research bear this point out.

The functional and participants approaches to agricultural marketing analysis do not address the production of these utilities in a fruitful way. Neither does the structure, conduct, performance approach using industrial organization theory which has been a widely used method of marketing analysis. Shaffer points out that the structure, conduct, performance approach takes the relevant market as a basic unit of research and treats the firm as a "black box." This approach assumes a causal relationship between the structure, conduct and performance of an industry; the existence of a monopolistic or oligopolistic structure implies suboptimal market performance. However, economists have been largely unsuccessful in attempts to demonstrate this empirically. Bressler and King (p. 410) ". . . urge the reverse attack: that is to study market performance,

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and then as required to move into detailed studies of the institutional factors that might properly be called structure." The analytical methods suggested by Bressler and King use the market equilibrium approach, focusing on the coordinating functions of a market.

Caves (1967, p. 97) ". . . defines market performance as the appraisal of how much the economic results of an industry's market behavior deviate from the best possible contribution it could make to achieving these [socioeconomic] goals." Other economists have used similar definitions. In recent years a broad social perspective has been used in defining market performance. This has been termed the outside in approach by Marion and Handy (p. 3). The problem of defining performance measures hinges on the definition of socioeconomic goals. Brewster points out that a goal represents a translation of human beliefs and values into a definable objective. Since economists, as human beings, have divergent beliefs and values their definitions of broad socioeconomic goals differ. Lacking a more narrow definition of socioeconomic goals, lists of performance measures have grown geometrically. Marion and Handy list no fewer than fifteen performance measures. They include sales promotion costs, character of the product, and the responsiveness of firms to societal needs as well as more traditional measures. Sosnick, Bain, and others have also developed lists of market performance measures. These contradictory and often incoherent lists constitute a quagmire into which many promising marketing analysts have sunk. Clearly some means of narrowing the definition of socioeconomic goals is necessary if a consistent set of market performance measures are to be derived. According to Brewster (P. 136) ". . . society clearly needs a way of nailing down both the qualitative and quantitative

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results of alternatives that is wholly indifferent to the value biases of all individuals and groups. Economic theory is well suited to this need."

While the ethical neutrality of economic theory is not undisputed, it does represent a body of knowledge with a generally accepted set of ethical assumptions. Therefore, socioeconomic goals are more narrowly defined in the context of modern welfare economics. This approach to marketing research is suggested by Brownlee. The use of economic theory to define socioeconomic goals, for the purposes of economic analysis of market performance, does not imply that broader social goals are not important in the total evaluation of a market's performance. This total evaluation is carried out through the clash of society's values and beliefs in the public policymaking process. The contribution of the marketing economist is to evaluate the economic performance or efficiency of markets under alternative policies. These policies should address issues such as equity and the responsiveness of industry to social needs which are difficult to define as economic performance measures. This might be termed the inside out approach to market performance.

Economic Performance Measures

The fundamental ethical judgment underlying welfare economics is that individuals' preferences count. Interpersonal comparisons of utility are not admitted. This assumption leads to the Pareto conditions for maximum social welfare. According to Henderson and Quandt (p. 225), "an allocation . . . described by specific consumption levels for each consumer and specific output levels for each producer . . . is Pareto-optimal if production and

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distribution cannot be reorganized to increase the utility of one or more individuals without decreasing the utility of others."

Assuming a perfectly competitive economy, we can use the concept of Pareto optimality to define economic welfare and describe performance criteria for an individual market. Pareto optimality is a relatively weak normative measure of welfare since it accepts a given income distribution. It does, however, provide us a measure of economic efficiency given an income distribution.

It has been shown that under the assumptions of perfect competition a general equilibrium results in Pareto optimality for an economy. The conditions for Pareto optimality require that the rates of substitution in consumption and rates of product transformation be equal for all goods in the economy. The rate of substitution in consumption between any two goods must equal their price ratio and the prices of inputs must equal their marginal value products.

Welfare economics in a general equilibrium framework is a cumbersome tool for the analysis of marketing problems within a single market. Within a partial equilibrium framework consumer's surplus, the area to the left of a Marshallian demand curve, provides a welfare measure. Over the years consumer's surplus has been the subject of much controversy among economists. Recently Willig has shown that consumer's surplus usually provides a reasonable measure of consumer's welfare.

Producer's surplus, the area to the left of a market supply curve, is quasi-rent or the return to fixed inputs.

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The maximization of producer's plus consumer's surplus in a single market yields the market equilibrium under perfect competition. This is a Pareto optimal result in a partial equilibrium context. This is demonstrated graphically in Figure 4.1. The shaded area A is the sum of producer's and consumer's surplus.

These conditions may also be derived mathematically. Given market demand and supply:

$$4.1. \quad Qd = f(P)$$

$$4.2. \quad Qs = g(M.C.)$$

Consumer's and producer's surplus may be defined by:

$$4.3. \quad C.S. = \int_0^{Q_d} (P)dQd - PQ$$

$$4.4. \quad P.S. = PQ - \int_0^{Q_s} (M.C.)dQs$$

Consumer's plus producer's surplus is maximized subject to the constraint that quantity supplied equals quantity demanded using a classical Lagrangian:

$$4.5. \quad MAX\ Z^* = \int_0^{Q_d} (P)dQd - \int_0^{Q_s} (MC)dQs + \lambda\ (Qd - Qs).$$

The first order conditions are:

$$4.6. \quad \frac{\partial z^*}{\partial Qd} = P + \lambda = 0$$

$$4.7. \quad \frac{\partial z^*}{\partial Qs} = M.C. - \lambda = 0$$

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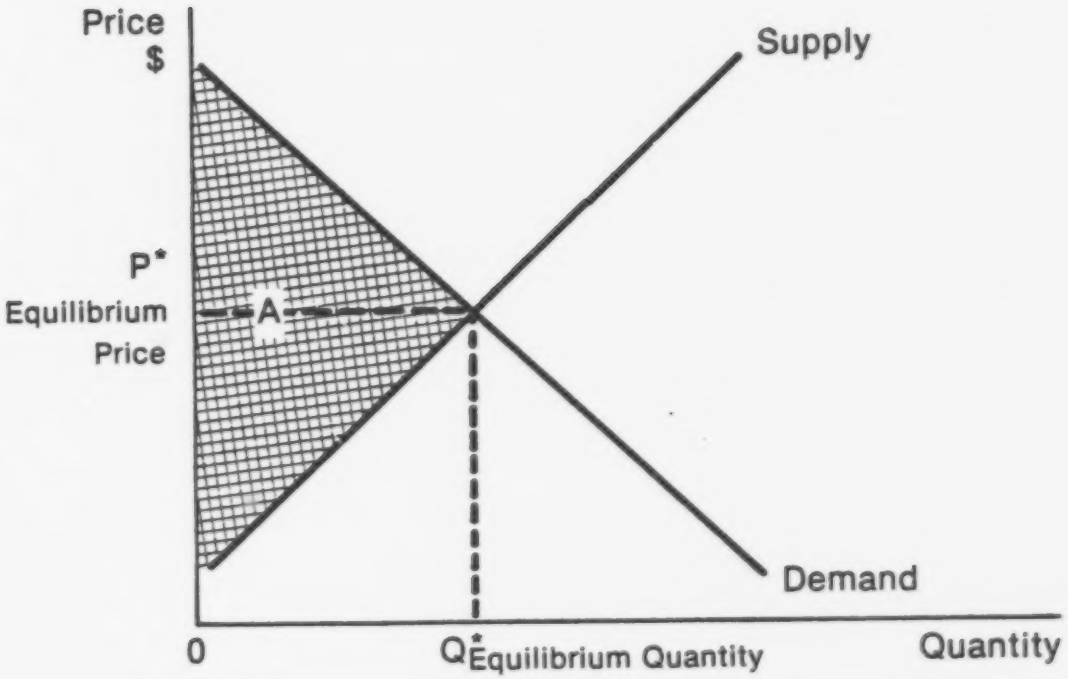
Figure 4.1 Consumers' and Producers' Surplus



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4.8. $\frac{\partial z^*}{\partial \lambda} = Qd - Qs = 0$

Solving equations 4.6 and 4.7 the condition for the competitive market equilibrium results.

4.9. $P = MC$

This welfare economics problem may be cast in a mathematical programming framework in which the maximization of consumer's plus producer's surplus is the objective function. Time, space, and form dimensions of the market could be included in this formulation. The solution of this programming problem would yield the optimal performance for the market being examined. The performance of the real world market could then be compared to the perfectly competitive optimum. This simple analysis provides economic efficiency criteria for a market. These criteria are based on the perfectly competitive norm and the theory of welfare economics. Deviation from the conditions for a perfectly competitive market equilibrium result in less than optimal performance under these criteria.

Based on this static analysis two categories of economic performance criteria for a market may be defined, (1) productive efficiency and (2) pricing efficiency. For a marketing system to display productive efficiency the system must be performing its processing, storage, and transportation functions at a minimum cost. The system is pricing efficient if prices reflect costs over time, space, and form dimensions of the market. Dynamic dimensions may be added to these performance criteria by relaxing the assumptions of fixed technology and perfect information of the static perfectly competitive model. The dynamic

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dimension of productive efficiency may be termed technological progressiveness, while pricing efficiency's dynamic aspect may be referred to as informational efficiency.

Productive efficiency has not generally been perceived as a major problem in the U.S. grain export system. However, pricing efficiency, especially the informational efficiency of central market prices, has been perceived as a serious problem in the grain export system.

Pricing Efficiency

Static pricing efficiency criteria for a market system are derived from the maximization of producer's plus consumer's surplus. The pricing efficiency criteria for the firm are (1) output price equals marginal cost and (2) input prices equal their marginal value product. For the system as a whole prices should differ over time, space, and form only by the costs of storage, transportation, and processing. Bressler and King examine price relationships of the time, space, and form dimensions of the perfectly competitive market. This analysis implies that we expect an efficient market to yield prices which reflect transportation costs over space, storage costs over time, and processing costs over form.

At the firm level inefficiencies in input pricing may resemble allocative inefficiencies in their effects. These inefficiencies may occur due to uncertainty about future prices. Where a firm forms an incorrect expectation of input prices, $E(\text{input}) \neq P(\text{input})$, it will not be operating on the expansion path as shown in Figure 4.2.

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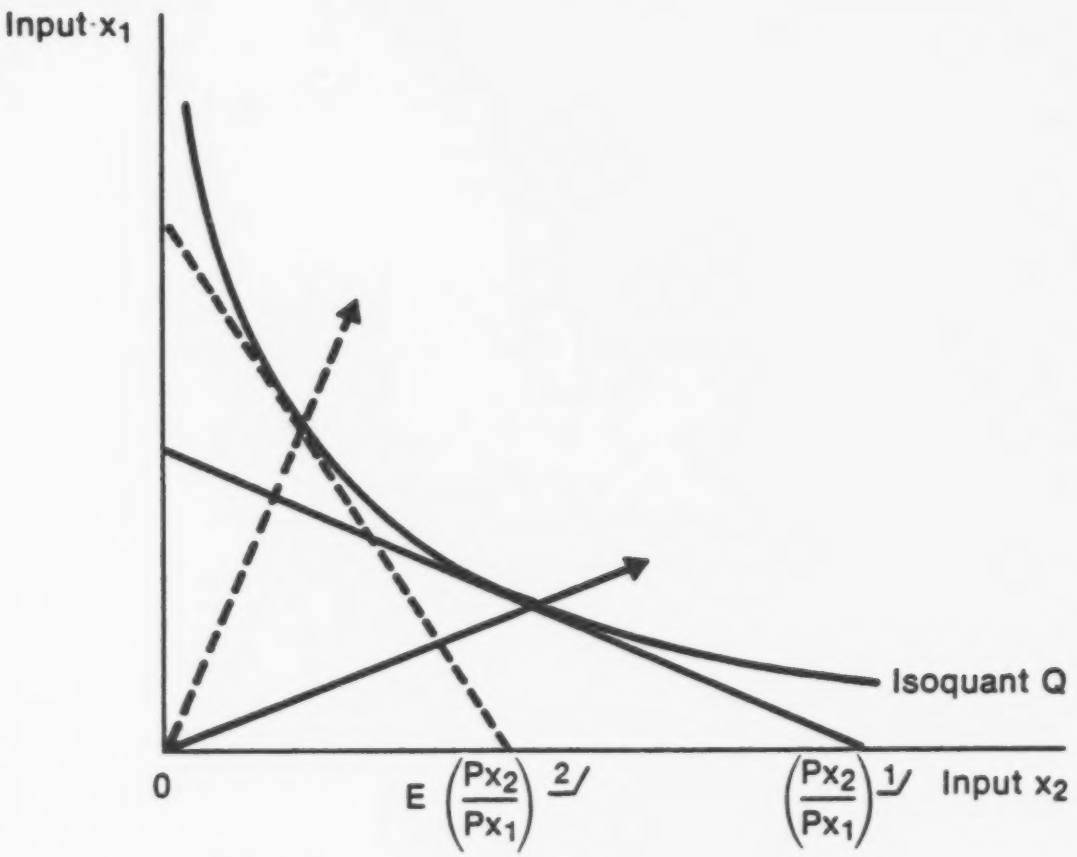
Figure 4.2 Input Pricing Efficiency of the Firm



1/ $\left(\frac{Px_2}{Px_1}\right)$ = True Value of the Ratio of Input Prices

2/ $\left(E\frac{Px_2}{Px_1}\right)$ = Expected Value of the Ratio of Input Prices

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If the firm makes an error in its expectation of output price, profit will not be maximized and output will be less than optimal. As shown in Figure 4.3, output will be at O_r instead of O*. Had an error in price expectation been made in the opposite direction the firm would have over rather than under produced. Over time and space dimensions of a market the lack of information and errors in expectations may also cause misallocation of resources.

The lack of information is not only source of pricing inefficiencies. Imperfect competition and the exercise of market power may result in prices differing from those under perfect competition. The case of a monopolistic firm is shown in Figure 4.4. The monopolist faces a downward sloping demand curve rather than a parametric price. Therefore he operates where marginal cost equals marginal revenue at Qm and charges Pm. This results in a transfer from the consumer to the monopolist in the form of excess profits.

Monopoly is a form of pricing inefficiency which has been commonly analyzed. Market structuralists have theorized that the degree of pricing inefficiency in a market is directly related to the degree of market concentration. Parker and Connor's estimates of consumer loss due to monopoly in food manufacturing is typical of this approach. Scherer (1970) estimated monopoly loss for the U.S. economy as a whole. However, in a more recent edition of his text (1980) he declines to present any estimates of such loss. In a review of Scherer's second edition MacAvoy points out that no general connection can be made between market structure and prices.

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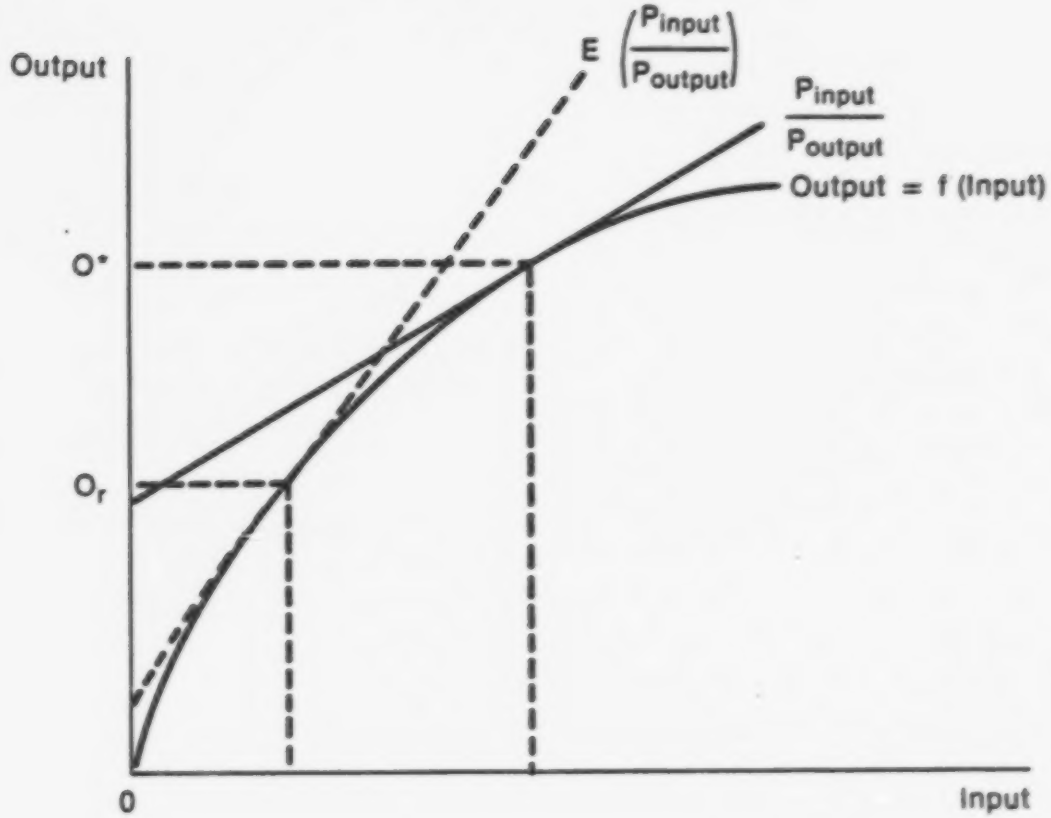
Figure 4.3 Output Pricing Efficiency of the Firm



$\frac{P_{input}}{P_{output}}$ = True Value of the Ratio of Input and Output Prices

$E\left(\frac{P_{input}}{P_{output}}\right)$ = Expected Value of the Ratio of Input and Output Prices

O^* = Optimal Level of Output

O_r = Realized Level of Output

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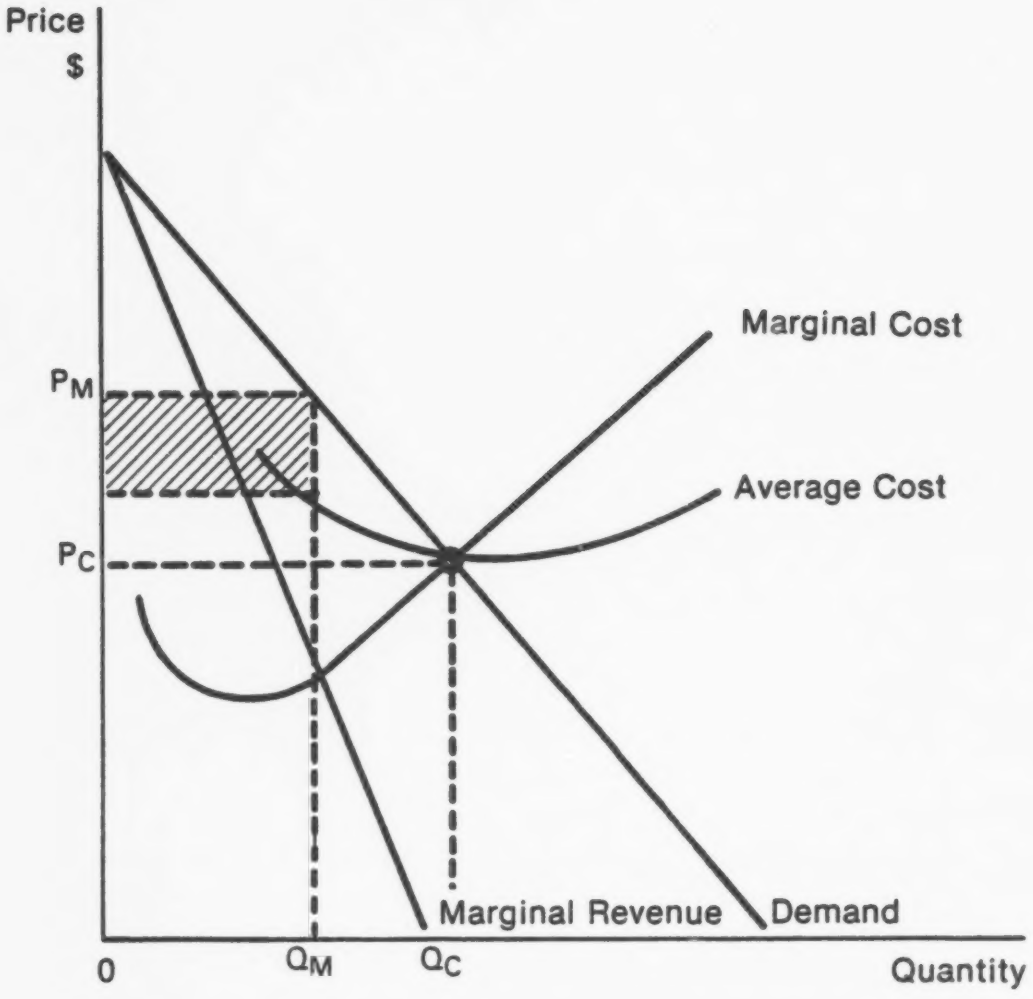
Figure 4.4 Pricing Inefficiency in a Monopolistic Market



P_M = Equilibrium Price in Monopolistic Market
P_C = Equilibrium Price in Competitive Market
Q_M = Equilibrium Quantity in Monopolistic Market
Q_C = Equilibrium Quantity in Competitive Market

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The pricing efficiency criteria discussed above are basically static in nature. However, sources of pricing inefficiencies such as uncertainty or lack of information lead us toward dynamic pricing efficiency criteria. The existence of perfect information is a critical assumption of perfectly competitive static market model. However, in the real world variables affecting demand and supply are constantly changing and the information concerning these variables is less than perfect. F. A. Hayek has suggested that prices serve as aggregators of this information, this is the very essence of price discovery. The performance of a market in price discovery depends on its ability to translate information into price. "A market in which prices always 'fully reflect' available information is called 'efficient'." (Fama, p. 383). The "efficient markets hypothesis" states that a competitive market displays this efficiency in information processing.

Fama identifies three types of market efficiency "weak," "semi-strong" and "strong." A weakly efficient market discounts all information contained in past prices. Semi-strong efficiency occurs where a market reflects all publicly available information, while strong efficiency requires all information including that held by insiders to be discounted. Although the efficient market hypothesis was developed in connection with financial markets it has been applied to such diverse subjects as pari mutual betting (Losey and Talbott) and the hog futures market (Leuthold and Hartman). The applicability of the efficient markets hypothesis to futures markets is important, since futures markets provide a central price discovery mechanism for the U.S. grain export system (Caves, 1977; Conklin, Wilbert and Dahl, 1979).

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The concept of reliably anticipatory futures prices by Holbrook Working (1949, 1958) foreshadowed the application of the efficient market hypothesis to futures markets.

> "The observation that the behavior of futures corresponded closely to random walk thus led to the economic concept that futures prices are reliably anticipatory; that is, they represent close approximations to the best current appraisals of prospects for the future . . . Custom has established the idea that reliability of uncertain expectations is to be tested by correspondence between the expectation and the event, but we need here to consider reliability of expectations in the sense of correspondence between the actual expectation and what ought to be expected in light of available information." (Working, 1961, p. 160).

In fact the behavior of futures prices as a random walk may be interpreted as evidence that futures markets are weakly efficient in the terminology of the efficient markets literature. Samuelson (1965, 1976) developed a theoretical proof for the random walk hypothesis. This hypothesis has been extensively tested (e.g. Rutledge, Stevenson and Bear, Labys and Granger), however, there is no general agreement on whether or not futures prices represent a random walk.

Semi-strong efficiency occurs where the market reflects all publicly available information. Leuthold and Hartman applied a semi-strong test of market efficiency to the hog futures market. An econometric model of the hog market was used to obtain predictions of future hog prices. These predictions are a proxy for price expectations consistent with all available public information. Then the predictive power of the model is compared to that of futures prices. Leuthold and Hartman conclude that the hog

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futures market displays some degree of informational inefficiency. Pasour points out that this study does not take into account the costs of obtaining information and therefore conclusions concerning inefficiencies in the market are unjustified. Panton also points out that profits resulting from information must be weighed against risk in the market.

Costly information is not consistent with perfect efficiency using the "efficient markets" definition. Grossman and Stiglitz note that if all information was reflected in market price there would be no incentive to gather information. In their model informational equilibrium is reached when the marginal firm is indifferent between becoming informed and using the market price. In other words the cost of acquiring the information is equal to the profit which it would generate in the market.

Figelewski develops an alternative market model in which informational equilibrium is achieved by wealth redistribution. In this model the market weights a trader's information by the size of his investment. Over time wealth is redistributed toward the successful forecasters, thus an equilibrium distribution of wealth would weight each trader's information according to its value. In this model poorer forecasters are not driven completely out of the market. Using a market model to simulate this process Figelewski concludes that more risk averse the traders are and the more homogeneous their forecasting abilities the more efficient the market will be.

The perceived pricing efficiency problems of the U.S. grain export system involve the possession of inside information by major grain export firms. For the grain markets

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to display strong form efficiency this "insider information" would have to be discounted by market price, implying that major exporters could not profit from advance knowledge of export sales. Heifner, Kahl and Deaton examined the futures markets transactions and net (cash and futures) positions of major grain exporters at times when large export sales were made. Their case study analysis yielded no firm conclusions regarding the ability of these firms to profit from inside information.

Analyzing the informational efficiency of futures markets in the U.S. grain export system is not an easy task. Firm level data is not accessible, nor is data on the costs of acquiring information which should be incorporated in a fully specified model. The analytical approach used in this study is to specify models of price behavior for the U.S. grain export system consistent with weak, semi-strong and strong form efficiency. Each of these models provides a null hypothesis for a given level of efficiency. These hypothesis may then be tested using the appropriate statistical techniques. The following chapter is devoted to the development of these models and statistical tools.

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References - Chapter 4

Bressler, Raymond G. and King, Richard A. Markets Prices and Interregional Trade. Raleigh, N.C.: Norman Weathers Printing Co., 1978.

Brewster, John M. A Philosopher Among Economists. Philadelphia: J.T. Murphy, 1970.

Brownlee, O.H. "Marketing Research and Welfare Economics," J. Farm Econ., Vol. 30, No. 1, Feb. 1948, pp. 55-68.

Caves, Richard. American Industry: Structure, Conduct, Performance. Englewood Cliffs, N.J.: Prentice Hall, 1967.

Caves, Richard. "Organization, Scale and Performance in the Grain Trade," Food Research Institutes Studies, Vol. 16, No. 3, 1977-78.

Conklin, Neilson C., Wilbert, Gerhard and Dahl, Reynold. "Pricing of Grain Exports and the Role of Futures Markets," Minnesota Agricultural Economist, No. 614, Agricultural Extension Service, University of Minnesota, Dec. 1979.

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work," J. Fin. 25, pp. 383-417.

Figelewski, Stephen. "Market Efficiency With Heterogeneous Information," Jour. of Polit. Econ., Vol. 86, No. 4, 1978, pp. 581-597.

Grossman, Sanford J. and Stiglitz, Joseph E. "Information and Competitive Price Systems," Amer. Econ. Rev., Vol. 66, No. 2, May 1976, pp. 246-253.

Hayek, F.A. "The Use of Knowledge in Society," American Econ., Sept. 1945, pp. 519-530.

Henderson, James M. and Quandt, Richard E. Micro Economic Theory: A Mathematical Approach, third edition. New York: McGraw Hill, 1980.

Labys, Walter C. and Granger, C.W.J. Speculation, Hedging and Commodity Price Forecasts. Lexington, Mass.: Heath, 1970.

BEST DOCUMENT AVAILABLE

Leuthold, Raymond M. and Hartman, Peter A. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market," Amer. J. Agr. Econ., Aug. 1979, pp. 482-488.

MacAvoy, Paul. "Learning to Love Oligopolies." New York Times, Sept. 28, 1980, pp.

Martin, Larry J. "Comparing Performance of Alternative Marketing Systems: A Suggested Approach With Special Reference to the Grain Markets of Canada and the United States." Paper presented at NC-139 technical meeting, Moscow, Idaho, August 1979.

Panton, Don B. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market: Comment," Amer. J. Agr. Econ., Vol. 62, Aug. 1980, pp. 584.

Pasour, E.D., Jr. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market: Comment." Amer. J. Agr. Econ., Vol. 62, Aug. 1980, pp. 581-583.

Rutledge, D.J.S. "A Note on the Variability of Futures Prices," Rev. Econ. and Stat., Vol. 58, No. 1, 1976, pp. 118-120.

Samuelson, Paul A. "Proof that Properly Anticipated Prices Fluctuate Randomly," Indus. Man. Rev. 6, Spring 1965, pp. 41-49.

Samuelson, Paul A. "Is Real-World Price a Tale Told by the Idiot of Chance?," Rev. Econ. and Stat., Vol. 58, No. 1, 1976, pp. 120-123.

Scherer, F.M. Industrial Market Structure and Economic Performance, first edition. Chicago: Rand-McNally, 1970.

Shaffer, James D. "Food System Organization and Performance: Toward a Conceptual Frame Work," Amer. J. Agr. Econ., Vol. 62, No. 2, May 1980, pp. 310-318.

Steiner, Robert L. "The Prejudice Against Marketing," Journal of Marketing, Vol. 40, July 1976, pp. 2-9.

Stevenson, Richard A. and Bear, Robert M. "Commodity Futures: Trends or Random Walks?," Journal of Finance, March 1970, pp. 65-81.

Willig, Robert D. "Consumer's Surplus Without Apology," Amer. Econ. Rev. 66, Sept. 1976, pp. 589-597.

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Working, Holbrook. "The Investigation of Economic Expectations," Amer. Econ. Rev., May 1949, pp. 150-156.

Working, Holbrook. "A Theory of Anticipatory Prices," Amer. Econ. Rev., Proceedings 48, May 1958, pp. 188-199.

Working, Holbrook. "New Concepts Concerning Futures Markets and Prices," Amer. Econ. Rev., Papers and Proceedings, May 1961, pp. 160-163.

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CHAPTER 5

MODELING THE INFORMATIONAL EFFICIENCY OF PRICES FOR THE U.S. GRAIN EXPORT SYSTEM

The central problem in this study is the informational efficiency of prices in the grain export system. The high degree of market concentration and secretiveness of major exporters has led some observers to conclude that these firms are beyond the control of market forces or the government and hence are able to profit from insider information through manipulation of the market. This perceived problem is illustrated by the following statement read by Rep. Neal Smith during hearings on export grain sales.

> "Once again we see the following scenario repeated: Grain companies make substantial fixed price sales, they then purchase more than enough in the cash and futures markets before U.S. sellers of grain know of the new demand; the grain exporters then wait for the news to come out for the market to move up. They then take profits on excess long futures after the market moves up on news of the sales." (U.S. Congress, House Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business, Export Grain Sales: Hearing, 96th Congress, 1st session, 11 June 1979, p. 11).

The problem is more serious than one of monopoly rents on insider information; if market prices do not efficiently reflect current information about export sales then the efficiency with which prices fulfill their allocative and distributive roles is doubtful.

The problem stated above concerns the informational efficiency of prices in the grain export system. The

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objective of this chapter is to derive criteria for informational pricing efficiency in a competitive market, based on the efficient market concept. The resulting hypotheses concerning price behavior may then be compared to the observed behavior of prices in the U.S. grain export system. The plan of this chapter is (1) to consider the flow of information in the U.S. grain export system; (2) to model information flow and price behavior for weak, semi-strong and strong form efficiency; and (3) to present the statistical techniques used in the empirical analysis.

Information Flows in the U.S. Grain Export System

The relatively high degree of concentration in the grain export industry, coupled with the large size of individual sales, means that an individual firm may possess information which will affect market price when it becomes public knowledge. One function of USDA's Export Sales Reporting System is to facilitate the transmission of this information to commodity markets. Through the Export Sales Reporting System the flow of information about export sales can be tracked over time, within certain limits.

Grain exports are reported to USDA on a weekly basis.1/ Before June of 1980, reports were made by exporters for Monday through Sunday on the following Thursday. The report for that week's activity was released after the close of commodity markets on the next Thursday, as shown in Figure 5.1.

1/ Large sales (greater than 100,000 tons) must be reported daily. However, only weekly data are needed in this analysis.

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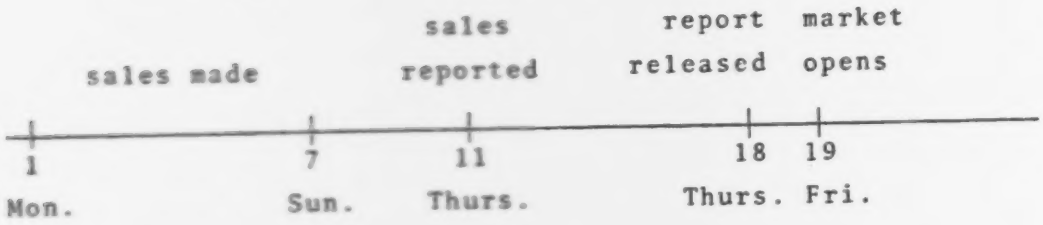
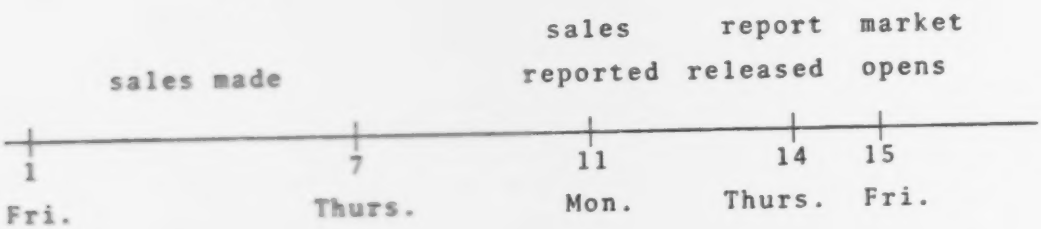
Figure 5.1 Export Sales Reporting Timeline Prior to June 1980



Under this system, there was a lag of 11 to 18 days from the time a sale occurred, until the report of sales activity was officially released to the public.

In June of 1980 the reporting week was changed to Friday through Thursday, with reports due at USDA on Monday. The report is released on the following Thursday under this system, thus the lag is cut to 7 to 14 days as shown in Figure 5.2.

Figure 5.2 Export Sales Reporting Timeline After June 1980



Consider the flow of information under the reporting system prior to 1980 shown in Figure 5.1.1/ From day 1 to day 10 only individual firms know about export sales made during days 1 through 7. Each firm knows about its own sales, and under some circumstance may be able to deduce

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1/ The system is not modeled for the period after June of 1980, since the time series is not long enough for analysis.

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the sales of its rivals. USDA receives the reports of these sales made during days 1 through 7 on day 11. Assuming that there is no "leakage" from USDA, this information becomes public knowledge after the markets close on day 18. On day 19 traders may begin to act on this information. A critical assumption is implicit in this description of information flow; exporting firms do not know in advance about sales made by overseas subsidiaries of affiliates, which are not reported until purchased in the United States. If this assumption is violated a firm may have advance information about export sales more than 18 days prior to the public release date. Given this basic pattern of information flow, models for weak, semi-strong and strong pricing efficiency in the U.S. grain export system may be defined.

Weak Form Informational Efficiency

Weak form pricing efficiency requires that current price discount all information in past prices. This means that price changes should represent a random walk. This implies that price changes are independent over time and that they correspond to some probability distribution. This probability distribution need not be normal, and in fact there is evidence (Stevenson and Bear) that the distribution of commodity price changes may be leptokurtopic.

The hypothesized behavior of prices under weak form efficiency is shown in equations 5.1 and 5.2:

$$5.1. \quad P_t = P_{t-1} + \varepsilon_t$$

$$5.2. \quad P_t - P_{t-1} = \varepsilon_t$$

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Where: $t=1,\ldots, n$ time in days

P_t = price at time t

$E(\epsilon_t) = \sigma^2$

$E(\epsilon_t, \epsilon_{t-1}) = 0 \; \forall \; i \neq 0.$

A test for the presence of weak form informational efficiency in the U.S. grain export system may be carried out by testing the random walk hypothesis posed above. However, testing for weak form efficiency alone does not address the problem at hand. How does price respond to changes in information about export grain sales? Some answers to this question may be found by examining higher levels of efficiency.

Semi-Strong Form Informational Efficiency

Following Fama, semi-strong informational efficiency requires that market price discount all public information. In the case of the U.S. grain export system, it is possible to define a point when information about new export sales becomes public, upon release of the export sales report by U.S.D.A. (See Figures 5.1 and 5.2.) If grain futures markets display semi-strong information efficiency, the change in price from Thursday's market close to Friday's close should be related to the report released on Thursday. The hypothesized behavior of prices in a market displaying semi-strong form efficiency is shown in equations 5.3, 5.4, 5.5 and 5.6:

$$5.3. \quad P_t = P_{t-1} + Y_t$$

$$5.4. \quad Y_t = P_t - P_{t-1}$$

$$5.5. \quad Y_t = \beta_0 + \beta_1 \sum_{j=12}^{18} ES_{t-j} + U_t$$

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$$5.6.\quad P_t - P_{t-1} = \beta_0 + \beta_1 \sum_{j=12}^{18} ES_{t-j} + U_t$$

Where: $t=1,\ldots, n$ time in days
P_t = price at time t
ES_{t-j} = export sales made at t-j
U_t = the effect of other random market information

This model of price behavior specifies price change, from the day preceding report release until the day following report release, as a function of the information contained in the report, the sum of export sales 12 to 18 days ago, and other random information. The hypothesis of semi-strong efficiency implies that market price responds to the public release of information. The hypothesis of semi-strong efficiency in the grain futures markets denies the possibility of price adjustment prior to report release. Since major grain exporters often make long hedges at the time an export sale is made,1/ it seems unlikely that no price response takes place at the time a sale is made. The hypothesis of strong form informational efficiency is therefore proposed as alternative.

Strong Form Informational Efficiency

Strong form informational efficiency requires that market price discount all information including that held by "insiders." This implies that market price adjusts prior to the release of information about new export sales by USDA. The hypothesized daily behavior of prices under

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1/ See Appendix 2 for a detailed description of export industry hedging practices.

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strong form efficiency is shown in equations 5.7, 5.8, 5.9 and 5.10:

$$5.7. \quad P_t = P_{t-1} + Z_t$$

$$5.8. \quad Z_t = P_t - P_{t-1}$$

$$5.9. \quad Z_t = \beta_0 + \beta_1 ES_{t-1} + V_t$$

$$5.10. \quad P_t - P_{t-1} = \beta_0 + \beta_1 ES_{t-1} + V_t$$

Where: $t=1,\ldots, n$ time in days
P_t = price at time t
ES_{t-1} = export sales at t-1
V_t = the effect of other random market information

In this case, daily price change becomes a function of export sales made during the preceding day and other random information affecting the market. However, daily data on export sales is not available. Therefore, a weekly model for price behavior under the hypothesis of strong form efficiency is constructed as follows:

$$5.11. \quad Z_t = P_t - P_{t-1}$$

$$5.12. \quad Z_{t-1} = P_{t-1} - P_{t-2}$$

$$\vdots$$

$$5.13. \quad Z_{t-6} = P_{t-6} - P_{t-7}$$

$$5.14. \quad Z_t = \beta_0 + \beta_1 ES_{t-1} + V_t$$

$$5.15. \quad Z_{t-1} = \beta_0 + \beta_1 ES_{t-2} + V_{t-1}$$

$$\vdots$$

$$5.16. \quad Z_{t-6} = \beta_0 + \beta_1 ES_{t-7} + V_{t-6}$$

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Summarizing the daily equations, assuming that $Z_t = f(ES_{t-j})$ is stable over time (i.e. β_0 and β_1 do not change) yields equations 5.17, 5.18 and 5.19:

$$5.17. \quad Z_T = \sum_{j=0}^{6} Z_{t-j} = P_t - P_{t-7}$$

$$5.18. \quad Z_T = \sum_{j=0}^{6} Z_{t-j} = 7\,\beta_0 + \beta_1 \sum_{j=1}^{7} ES_{t-j} + \sum_{j=0}^{6} V_{t-j}$$

$$5.19. \quad P_t - P_{t-7} = 7\,\beta_0 + \beta_1 \sum_{j=1}^{7} ES_{t-j} + \sum_{j=0}^{6} V_{t-j}$$

This weekly model specifies weekly price change as a function of export sales made during the week and other random information.

Three alternative hypotheses of price behavior in the U.S. grain export system have been proposed: (1) weak form efficiency, (2) semi-strong form efficiency, and (3) strong form efficiency. Hypothesis tests for each of these forms of efficiency are constructed using spectral analysis and cross spectral analysis.

Spectral Analysis

Spectral analysis of a time series may be used to detect cyclical patterns in data which may otherwise appear random. This method has been used to test futures markets for weak form pricing efficiency (Labys and Granger). Spectral analysis converts time series observations into frequencies and allows the analyst to identify differences in price patterns and relationships, in the short (high frequency), the intermediate (middle frequency) and the long (low frequency) run.

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The time series to be analyzed in this study are changes in commodity prices and reported export sales (equations 5.2, 5.6 and 5.19). These time series are both discrete in nature, that is the variables are only reported at discrete moments in time. The recorded observations of these series represent a single realization of some underlying generating process. Since only one realization of the series can be obtained, it is not possible to draw statistical inferences about the underlying generating processes at any moment in time. Therefore the assumption must be made that these time series are second order stationary, that is, their mean and variance are constant over time.

Given the assumption of stationarity, estimates of covariances of the time series, X_t t=1,..., n, may be obtained (Labys and Granger, p. 40):

$$5.20. \quad \text{Cov}\ (X_t, X_{t-j}) = \frac{1}{n-j} \sum_{t=j+1}^{n} (X_t - \bar{X})\ (X_{t-j} - \bar{X})$$

$$\text{Where:} \quad \bar{X} = \frac{1}{n} \sum_{t=1}^{n} X_t$$

These covariance estimates contain much useful information about a time series. For example, consider the model for weak form price efficiency (equations 5.1 and 5.2), where a time series of price changes represents a random walk. Where:

$$5.21. \quad X_t = P_t - P_{t-1}, \qquad t = (i,..., n),$$

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X_t and X_{t-j} must be uncorrelated for $j \neq 0$. In this case, Cov $(X_t, X_{t-j}) = 0$ for $j = 0$. An alternative model to the random walk is the linear cyclical model (Labys and Granger, p. 41):

$$5.22. \quad X_t = \sum_{i=1}^{m} C_i \text{ Cos } (\omega_i + \theta_i) + e_t.$$

The time series X_t is made up of the sum of cyclical components with amplitudes C_i, frequencies ω_i, phases θ_i and a random residual e_t. The parameters of the model may be estimated by the periodogram,

$$5.23. \quad I_n(\omega) = \frac{1}{n}\left[\left(\sum_{i=1}^{n} x_j \text{ Cos } 2\pi i\omega\right)^2 + \left(\sum_{i=1}^{n} X_i \text{ Sin } 2\pi i\omega\right)^2\right]$$

(Labys and Granger, p. 41).

The spectral representations of a time series and its covariance sequence involve the use of Fourier transforms and other complicated mathematics (Fuller, Granger and Hatanaka). However, the basic idea behind spectral analysis may be explained in a relatively simple manner (Labys and Granger, pp. 43-45). For example, suppose the time series shown in equation 5.18 is composed of a number of cyclical components expressed as:

$$5.24. \quad X_t = \sum A_i \text{ Cos } (t\omega_i + \theta_i)$$

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Where: A_i = amplitude
ω_i = frequency
θ_i = phase

and where frequency corresponds to "time period" $P = 2\pi/\omega$. Furthermore, assume that the amplitudes (A_i) and phase (θ_i) are independent random variables for the underlying generating process (which we cannot observe) but are fixed and constant for the individual realization, the time series of interest (which we can observe). Given these assumptions X_t is a finite sum of independent components with

$$5.25. \quad \text{Var } (X_t) = 1/2 \sum_{i=1}^{m} \sigma_i^2,$$

and

$$5.26. \quad \text{Cov } (X_t, X_{t-j}) = 1/2 \sum_{i=1}^{m} \sigma_i^2 \text{ Cos } j\omega_i.$$

The covariance sequence where $j = 0, 1, 2, \ldots$ is

$$5.27. \quad \text{Cov } (j) = \int_{-\pi}^{\pi} \text{Cos } j\omega dF(\omega),$$

where $F(\omega)$ is a step function with steps $1/2\ \sigma_i^2$ at ω_i.

The importance of each component of the time series is measured by its contribution to the total variance of the time series. Where the number of components (i) in the model becomes very large the contribution of individual components becomes small. However, the contribution of a group of components in some band of frequencies may be considered. In the limit no one component makes a finite

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contribution to the variance of the time series but the sum of components within a given frequency band does contribute to the variance. This is a continuous rather than a discrete relationship. Thus the covariance sequence may now be represented as:

$$5.28. \quad \text{Cov}(j) = \int_{-\pi}^{\pi} \text{Cos } j\, f(\omega) d\omega,$$

where $f(\omega)$ is the derivative of $F(\omega)$ (equation 5.24) and is known as the spectral density function of power spectrum.

The power spectrum $f(\omega)$ need only be estimated over the range $0 < \omega < \pi$ since it is symmetric and periodic. While the periodogram is an unbiased estimate of the power spectrum, it is very unsmooth in nature. The power spectrum may be estimated by smoothing the periodogram, however an alternative approach is shown below. The covariance sequence (equation 5.23) is estimated by:

$$5.29. \quad \hat{C}_j = 1/n \sum_{t=1}^{n-j} (X_t - \bar{X})\,(X_{t-j} - \bar{X}),$$

where $\bar{X} = \frac{1}{n} \sum_{t=1}^{n} X_t$ (Labys and Granger, p. 57).

The power spectrum is estimated at frequencies $\omega_i = i/m$ where $i = 0, \ldots m$ by:

$$5.30. \quad \hat{f}(\omega_i) = \frac{Co}{2\pi} + \frac{1}{\pi} \sum_{j=1}^{m} C_j\, \lambda_j\, \text{Cos } \omega_i\, j,$$

where weights $\lambda_j = 1 - \left[\left|\frac{j}{m}\right|\right]$, $|j| \leq m$, $0\ |j| > m$.

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These weights constitute a Bartlett lag window where m is the cutoff point for the number of lags used. This window has the effect of smoothing the periodogram as discussed above. In this case degrees of freedom depend jointly on the number of observations (n) and the lag cutoff (m), d.f. = $3\frac{n}{m}$.

The spectral model decomposes a time series into a large number of individual components each associated with a frequency, which can be converted to time domain. The contribution of any group of these components to the variance of the time series is a measure of their relative importance. Where no group of components makes a significant contribution to the variance the time series is random not cyclical. Therefore, spectral analysis may be used to test the random walk hypothesis (equations 5.1 and 5.2). An appropriate test for this hypothesis is Fisher's Kappa which is the ratio of the largest periodogram ordinate, $I_n(L)$, to the average value of the periodogram:

$$5.31. \quad K = \frac{I_n(L)}{\frac{1}{m}\sum_{n=1}^{m} I_n(\omega)}$$

The derivation and distribution of this statistic is given in Fuller (pp. 284-285). Where K is greater than Kappa, the hypothesis of a random walk is rejected.

Cross Spectral Analysis

In order to determine which model, strong form or semi-strong form efficiency, is appropriate to the U.S. grain export system these equations (5.6 and 5.19) are estimated for wheat, corn and soybeans using ordinary least

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squares and were examined for goodness of fit. The initial results of this analysis, presented in Chapter 7, showed that neither equation was statistically significant for any of the three commodities. This is not surprising, since new export sales are only one small piece of information having an impact on futures market prices for major grains. Previous research on the relationship between export sales reports and prices (GAO, ID-76-87) seemed to confirm this conclusion. A more sensitive form of analysis was necessary to address the problem at hand. Cross spectral analysis of time series was selected as an alternative technique.

The semi-strong and strong form efficiency models require information about the relationship between price changes and export sales over time. Cross spectral analysis is useful for this purpose. Given two stationary time series X_t and Y_t with power spectra $f_x(\omega)$ and $f_y(\omega)$ which are jointly stationary, and have no periodic components, the cross lagged covariance is represented by:

$$5.29. \quad \text{Cov}(X_t, Y_{t-j}) = \int_{-\pi}^{\pi} e^{ij\omega} \, Cr(\omega) \, d\omega$$

(Labys and Granger, p. 50). $Cr(\omega)$ is a complex function referred to as the cross spectrum. Two useful functions may be derived from the cross spectrum, the coherence and the phase.

$$5.30. \quad C(\omega) = \frac{\{cr(\omega)\}^2}{f_x(\omega) \, f_y(\omega)}$$

(Labys and Granger, p. 50). Since $f_x(\omega)d\omega$ and $f_y(\omega)d\omega$ represent the variance of the amplitude of the frequency

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component of X_t and Y_t and Cr (ω) $d\omega$ is the covariance between the amplitudes of frequency components of the series; $C(\omega)$ is the square of the correlation between amplitudes of the frequency components of the time series (Labys and Granger, p. 51).

The appropriate test for the hypothesis:

$H_o : C = 0$

$H_a : C \neq 0$

is made by comparing the critical value of the coherence at a preselected level of significance (Koopmans, p. 285).

$$\tilde{C} = \frac{F^2_{v-2}}{v - 1 + F^2_{v-2}}$$

Where: $v = 3\,\frac{n}{m}$

to the estimate $\hat{C}$, of the coherence:

$\hat{C} \geq \tilde{C}$ reject the null hypothesis

$\hat{C} < \tilde{C}$ accept the null hypothesis

The coherence provides a correlation squared at each frequency of the two decomposed time series. Thus the two series may be more or less related at various lengths of run. In this case, we would expect to find a high coherence between price changes and new export sales in the short run, representing the effect of "perishable" market news on price. To the extent that new export sales are

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also a measure of shifts in demand, significant coherences may also be expected in the long run. Thus, a test of the null hypothesis that the coherence between export sales reports and price change the following day is not equal to zero, is a partial test of the semi-strong form efficiency hypothesis. This is a necessary, but not a sufficient, condition for semi-strong efficiency. The same test may be applied to the coherence between new export sales and weekly price change, as a test of the strong form efficiency hypothesis.

Assuming that price changes and new export sales are related (strong form model) the key to market efficiency is the lag structure of these two time series. If price changes do not lag behind export sales, strong form efficiency is indicated. Where the lag is between 11 and 18 days the market may be semi-strongly efficient, while a lag of greater than 18 days means the market does not display semi-strong efficiency.

The lag structure of the semi-strong efficiency model, relating price changes and export sales reports, may be interpreted in a similar manner. In this case, no lead or lag between export sales reports and price changes indicates semi-strong efficiency. A lead of the price change series would imply some degree of strong form efficiency; the market is shown to be discounting information about new export sales before the report release date. Should price changes lag behind export sales reports the market is not semi-strongly efficient.

An estimate of these lag structures may be obtained from the phase function generated by cross spectral analysis. The phase, $\emptyset(\omega) = \tan \frac{\text{imaginary part of Cr } (\omega)}{\text{real part of Cr } (\omega)}$

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(Labys and Granger, p. 50), is a function of frequency. If there is no lag between the two time series (X_t, Y_t) $\phi(\omega) = 0$. Where a fixed time period lag between the two series exists $\phi(\omega) = K$ where K is some constant. Thus the lag K may be determined by examining the slope of the phase function, $K = \frac{\phi(\omega)}{\omega}$. A third case is where the phase lies around some constant, a, other than 0, $\phi(\omega) = a$. This is known as a fixed angle lag where the time lag is a/ω. In this case the length of lag increases as frequency, ω, decreases; lags become longer as the length of run becomes greater. Confidence intervals for the phase are defined by

$$\phi(\omega) \pm \text{Sin}^{-1}\left[\frac{1-\hat{C}}{\hat{C}} \frac{1}{v-2} t^2_{v-2}(\alpha/2)\right]^{1/2}$$

(Koopmans, p. 285). Where the coherence, $\hat{C}$, is not statistically significant the phase becomes very erratic and cannot be interpreted in any meaningful way. The interpretation of phase diagrams involves as much art as science, and may be difficult where complex lag structures are involved. Where feedback, or two-way causality, exists between two time series the theoretical lag structure is extremely complex and interpretation of the phase diagram is not possible (Labys and Granger, p. 52).

Summary

Three models have been constructed for the informational efficiency of prices in the U.S. grain export system based on the efficient markets hypothesis:

1. Weakly efficient market - price changes are a random walk.

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2. Semi-strong efficient market - price changes incorporate publicly available information about new export sales.

3. Strongly efficient market - price changes incorporate all current information about new export sales.

These three hypothesized forms of price behavior may be compared to the observed behavior of prices in the grain futures markets using spectral analysis and cross spectral analysis. The results of this analysis are presented in the following chapter.

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References - Chapter 5

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work," J. Fin. 25, pp. 383-417.

Fuller, Wayne A. Introduction to Statistical Time Series. New York: John Wiley, 1976.

Granger, C.W.S. and Hatanaka, M. Spectral Analysis of Economic Time Series. Princeton, N.J.: Princeton Univ. Press, 1964.

Koopmans, L.H. The Spectral Analysis of Time Series. New York: Academic Press, 1974.

Labys, Walter C. and Granger, C.W.J. Speculation, Hedging and Commodity Price Forecasts. Lexington, Mass.: Heath, 1970.

Stevenson, Richard A. and Bear, Robert M. "Commodity Futures: Trends or Random Walks?," Journal of Finance, March 1970, pp. 65-81.

U.S. Congress, House Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business. Export Grain Sales: Hearing, 96th Congress, 1st session, June 11, 1979.

U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports. Report to the Congress, ID-76-87, May 2, 1977.

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CHAPTER 6

INFORMATIONAL PRICING EFFICIENCY OF THE U.S. GRAIN EXPORT SYSTEM, SOME EMPIRICAL EVIDENCE

Empirical Results

The informational efficiency of central market prices in the U.S. grain export system has been identified as a serious problem. Results of the empirical analysis of this problem, using the three pricing efficiency models (Chapter 5), are presented in this chapter. Tests of the weak form model, or random walk hypothesis, are conducted using spectral analysis. The semi-strong and strong form pricing efficiency models are examined using both regression and spectral analysis.

The five-year time period, June 1975 to June 1980, was chosen for analysis. This period was selected because complete and accurate data on grain export sales is not available for the period prior to June of 1975 and the timing of export sales reports was changed in June of 1980. All commodity prices used in the analysis represent the closing price of the near future on the Chicago Board of Trade, obtained from the Commodity Futures Trading Commission. Export sales data represent net new export sales made for both current and next marketing year, as reported by the Foreign Agriculture Service in U.S. Export Sales.

Spectral analysis requires these time series to be second order stationary. Plots of exports, weekly price changes, and daily price changes for wheat, corn and soybeans (Appendix 3), reveal no obvious stationarity

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problems. Stationarity tests were also performed on these time series. Tests for time trends were made by regressing the time series on a trend variable using the model $P_t - P_{t-1} = \beta_0 + \beta_1 T_t + \varepsilon_t$, where T_t is a trend variable. The appropriate hypothesis test for the presence of a time trend is:

$$Ho : \beta_1 = 0$$

$$HA : \beta_1 \neq 0$$

Where: $\tilde{t} > t(\alpha/2;\ 250)$ reject Ho

$\tilde{t} < t(\alpha/2;\ 250)$ do not reject Ho

Tests for stability of the variance of the time series was made by splitting each and estimating the variance for part of the series and performing the following test:

$$Ho \quad \sigma_1^2 = \sigma_2^2$$

$$HA \quad \sigma_1^2 \neq \sigma_2^2$$

Where: $\dfrac{\sigma_1^2}{\sigma_2^2} \quad F_D^N\ (\alpha/2)$ accept Ho

$\dfrac{\sigma_1^2}{\sigma_2^2} \quad F_D^N\ (\alpha/2)$ reject Ho.

The results of these stability tests are shown in Table 6.1. The test for time trends indicated a trend only for new export sales of soybeans. Therefore, this time series was detrended using this same regression as

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Table 6.1 Stationarity Tests Results

Variable	t test for trend coefficient	$F = \frac{\sigma_1^2}{\sigma_2^2}$	F(.05/2)
Weekly change in wheat price	1.36	1.16	1.432/
Daily change in wheat price	.97	1.20	1.43
Total new wheat sales	.93	1.40	1.43
Weekly change in corn price	.86	1.15	1.43
Daily change in corn price	1.11	1.17	1.43
Total new corn sales	1.89	1.28	1.43
Weekly change in soybean price	.19	1.41	1.533/
Daily change in soybean price	.19	1.50	1.53
Total new soybean sales	4.061/	1.26	1.43

1/ Statistically significant at 95 percent level.

2/ With 125 and 125 degrees of freedom.

3/ With 100 and 150 degrees of freedom.

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suggested by Granger and Hatanaka. Tests for the stability of variance required the deletion of one outlying value in both the wheat and corn export sales series. These values were over ten standard deviations from the means and resulted from large buybacks of export sales contracts following the U.S.S.R. grain embargo. The two soybean price change series were split in June of 1977 rather than December of 1978. This procedure divided the larger price changes, resulting from the 1977 soybean price rise, evenly between the two samples. When these adjustments were made the variance was found to be stationary for all nine time series.

Semi-Strong and Strong Form Tests, Regression Analysis

A preliminary analysis of the semi-strong and strong form models of informational efficiency for the U.S. grain export system (see Chapter 5) was conducted using regression analysis. Equations 6.2 and 6.3 were estimated for wheat, corn, and soybeans by ordinary least squares using the Sysreg procedure of the Statistical Analysis System (S.A.S., p. 403).

$$6.2. \quad Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$$

Where: $Y_t = P_t - P_{t-1}$ = the change in the closing price of the near future, Chicago Board of Trade, from the day preceding the Export Sales report release (Thursday) to the first market day following its release.

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$$X_t = \sum_{j=12}^{18} ES_{t-j}$$ = the reported Export Sales released at time t, following market close.

$\varepsilon_t \sim N(0, \sigma^2)$

6.3. $Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t$

Where: $Y_t = P_t - P_{t-1}$ = weekly change (Monday to Monday) in the closing price of the near future, Chicago Board of Trade.

$$X_t = \sum_{j=1}^{7} ES_{t-j}$$ = the sum of Export Sales for the same week (Monday through Sunday).

$\varepsilon_t \sim N(0, \sigma^2)$

The results of this analysis are presented in Table 6.2.

Neither the semi-strong nor the strong form models of pricing efficiency yielded statistical results significantly different from zero for wheat, corn and soybeans. Regression analysis identifies no relationship between export sales and price changes. This result is not startling. Export sales and export sales reports represent a very small proportion of private and public information which affects futures markets daily. An additional problem is the potentially complex lag structure, resulting from the nature of the export sales reporting system and the "friction" (lags in market adjustment) in futures markets themselves. Cross spectral analysis was selected as an

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Table 6.2 Regression Results, Semi-Strong and Strong Form Pricing Efficiency Models, Corn, Wheat, and Soybeans

	Semi-Strong			Strong		
Commodity	R^2	F	D.W.	R^2	F	D.W.
Wheat	.0023	.59	2.1680	.0032	.791/	2.3055
Corn	.0010	.25	2.0191	.0038	.951/	2.0084
Soybeans	.0064	1.611/	2.0036	.0044	1.111/	2.1163

1/ Not significantly different from zero at the 95 percent level.

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appropriate technique for the examination of these lags and market adjustment processes.

Cross Spectral Analysis

The spectral analysis procedure in the Statistical Analysis System (S.A.S., p. 381) was used to analyze the relationships between daily price changes and export sales reports (semi-strong form model), and between weekly price changes and export sales made during the same week (strong form model). Cross spectral analysis of these models does reveal statistically significant relationships not uncovered by the regression analysis reported above.

Cross spectral analysis yields estimates of the coherence, comparable to the R^2, at each of $\underline{N}$ frequencies over the range zero to π (see Chapter 5). The average value of these coherences is comparable to an R^2, but is equal to it only under certain restrictive conditions (Labys and Granger, pp. 199-203). In general the average value of these coherences will be higher for two variables than the comparable R^2 value. Cross spectral analysis results for the semi-strong and strong form pricing efficiency models of the U.S. grain export system confirm this. The average values of coherence shown in Table 6.3 are all significantly different from zero and are much larger than the comparable R^2 values reported for the regression analysis in Table 6.2.

These results indicate that over all frequencies a statistically significant relationship exists between export sales during a given week and price change during the same week. A statistically significant relationship between export sales reports and price change on the

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Table 6.3 Average Coherence Between Price Changes and Export Sales Information for Wheat, Corn and Soybeans

	Semi-Strong	Strong
Commodity	$\tilde{C}(P_t - P_{t-1}, \sum_{j=12}^{18} ES_{t-j})$	$\tilde{C}(P_t - P_{t-1}, \sum_{j=1}^{7} ES_{t-j})$
Wheat	.10 2/	.13 1/
Corn	.15 1/	.09 2/
Soybeans	.15 1/	.17 1/

1/ Significantly different from zero at the 99 percent level, where the critical value of coherence

$$\tilde{C} = \frac{F^2_{v-2}}{v-1 + F^2_{v2}} = .12.$$

2/ Significantly different from zero at the 95 percent level, where $\tilde{C} = .08$.

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following market day is also indicated. This implies that futures markets for wheat, corn and soybeans respond to both private and public information concerning grain export sales. The wheat and soybean markets reveal slightly higher average coherence values for the strong form model, than for the semi-strong form model. However, in the corn market average coherence is higher for the semi-strong form model. These results imply that prices in the wheat, corn, and soybean futures markets respond to information about new export sales.

Average coherence values are highest for soybeans and wheat, which is not a surprising result since these two commodities are more export dependent than corn. Overall, the explanatory power of export sales information with respect to market price changes is relatively low, with variation in information about new export sales explaining 17 percent or less of the variation in price changes. This is not a surprising result either considering the tremendous amount of other information which affects futures markets every day. The weak relationship between unreleased export sales information and futures prices also implies, that over time, the potential for large and sustained returns to this information is limited.

Further insights into the relationships between export sales information and price changes may be gained from an examination of coherences over the entire range of frequencies, from the short to the long run. Plots of the coherence between weekly price changes and new export sales (the strong model) for wheat, corn and soybeans are presented in Figures 6.1, 6.2 and 6.3.

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Figure 6.1 COHERENCE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF WHEAT

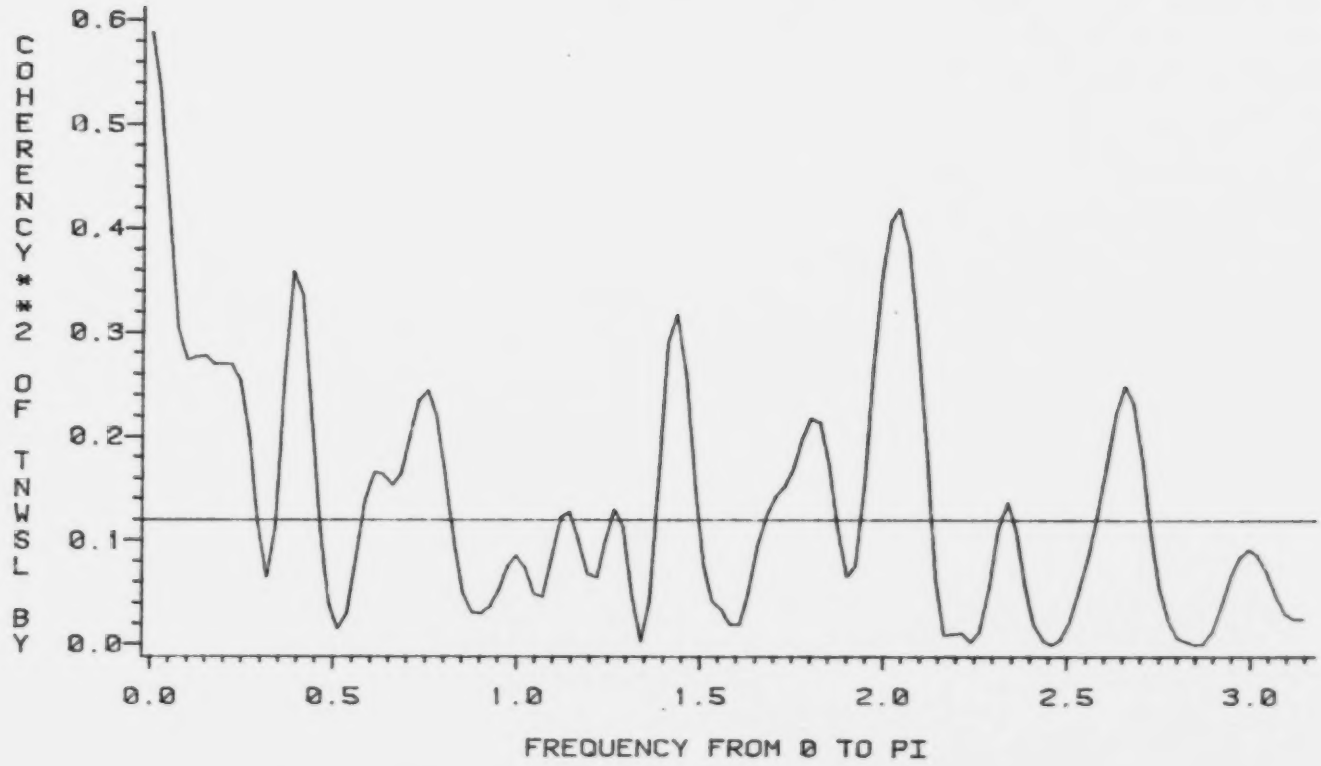

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Figure 6.2 COHERENCE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF CORN

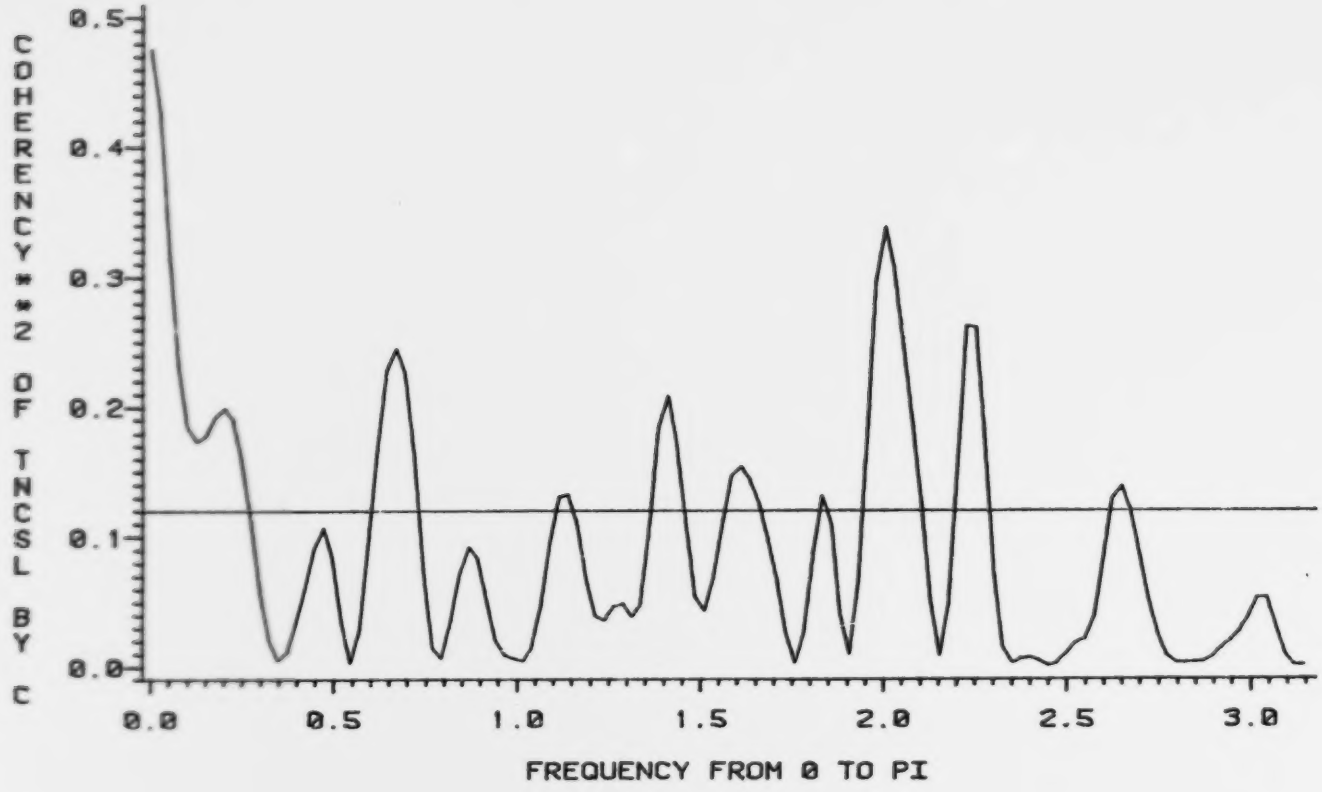
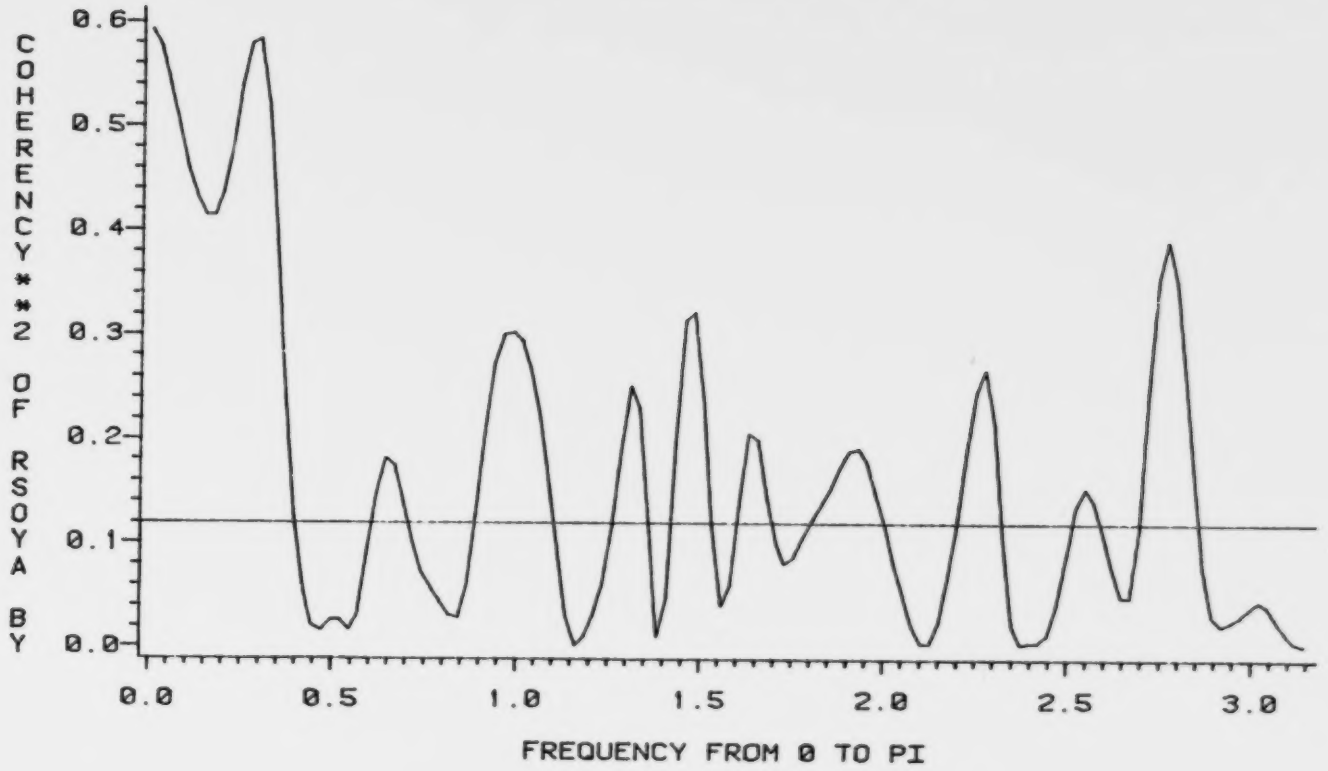


Figure 6.3 COHERENCE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF SOYBEANS



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Strong Form Efficiency Tests

Strong form efficiency of a market implies that the market price reflects all current information, including insider information. Plots of the coherence, by frequency, for strong form models of the wheat, corn and soybean markets are shown in Figures 6.1, 6.2 and 6.3. The relationships between information about new export sales (not yet released to the public), and weekly changes in the price of the near future, are displayed over frequencies from zero to pi. All three markets display high coherences in the short run with peaks at frequencies corresponding to around two and three weeks. All three markets also display high coherences in the longer run, perhaps indicating the "fundamental" effect of export sales on market prices over longer periods. Although significant coherences between information about new export sales and weekly price changes indicate some market adjustment to private information, any conclusions about the degree of strong form efficiency hinge on the lag structure of this relationship.

For the hypothesis of strong efficiency to hold, there must be no lag between the two time series, export sales reports and daily price changes. The lag structure of these time series is decomposed by cross spectral analysis and inferred from plots of the phase (Chapter 5). Variance of estimates for the phase becomes very large for low values of the coherence, and are not meaningful outside frequency ranges where the coherence is statistically significant (Granger and Hatanaka, p. 89). Tests for time and angle lags have been proposed (Granger and Hatanaka, pp. 103-104). However, these tests do not take into account the variation in the significance of phase estimates due to fluctuations in the coherence. In this case,

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where values of the coherence are very low, and not statistically significant over many frequency ranges, one must rely on visual evidence in order to interpret phase diagrams.

The presence of feedback, or two-way causality between two time series, renders the interpretation of phase plots impossible since the theoretical shape of the phase diagram is extremely complex (Labys and Granger, p. 52). In the case of the semi-strong form model, feedback is precluded, since the export sales report variable precedes the price change variable in time. However, in the case of the strong form model, feedback is a definite possibility since price changes over the course of a week may influence export sales during that week. Thus the lag structure of the strong form models for wheat, corn and soybeans must be interpreted with caution, due to the possibility of feedback.

Estimates of the phase for the strong form relationships appear to oscillate around zero for all three commodities. Plots of these estimates are shown in Figures 6.4, 6.5 and 6.6. Additionally a non-parametric sign test (Granger and Hatanaka, pp. 103-104) was used to test the hypothesis that the expected value of the phase is zero, or that the probability of a positive (or negative) value of the phase is .5:

$$H_o : \Pr(\emptyset > 0) = .5$$

$$H_a : \Pr(\emptyset > 0) \neq .5.$$

The appropriate test statistic in this case is $Z = y - \frac{n}{2}\sqrt{n}$, where y is the number of estimates of the

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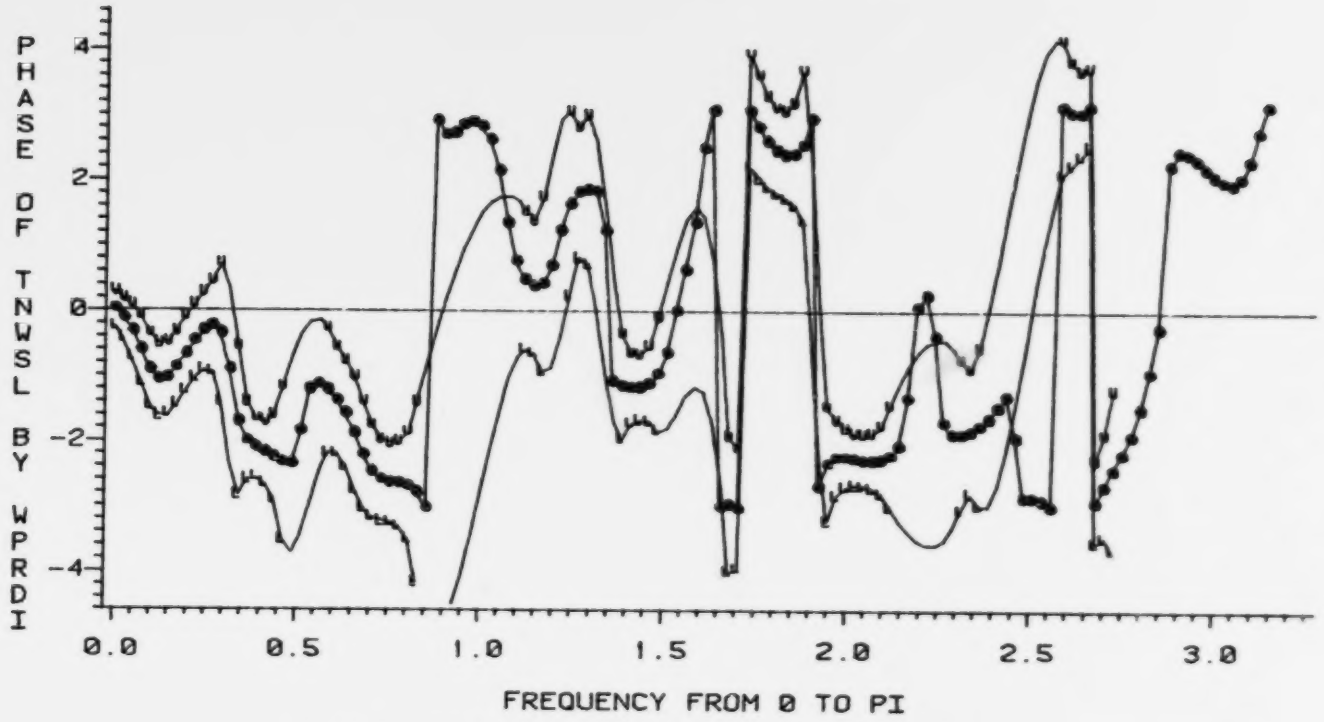
Figure 6.4 PHASE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF WHEAT



U = UPPER CONFIDENCE LIMIT, 95% LEVEL
L = LOWER CONFIDENCE LIMIT, 95% LEVEL

Figure 6.5 PHASE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF CORN

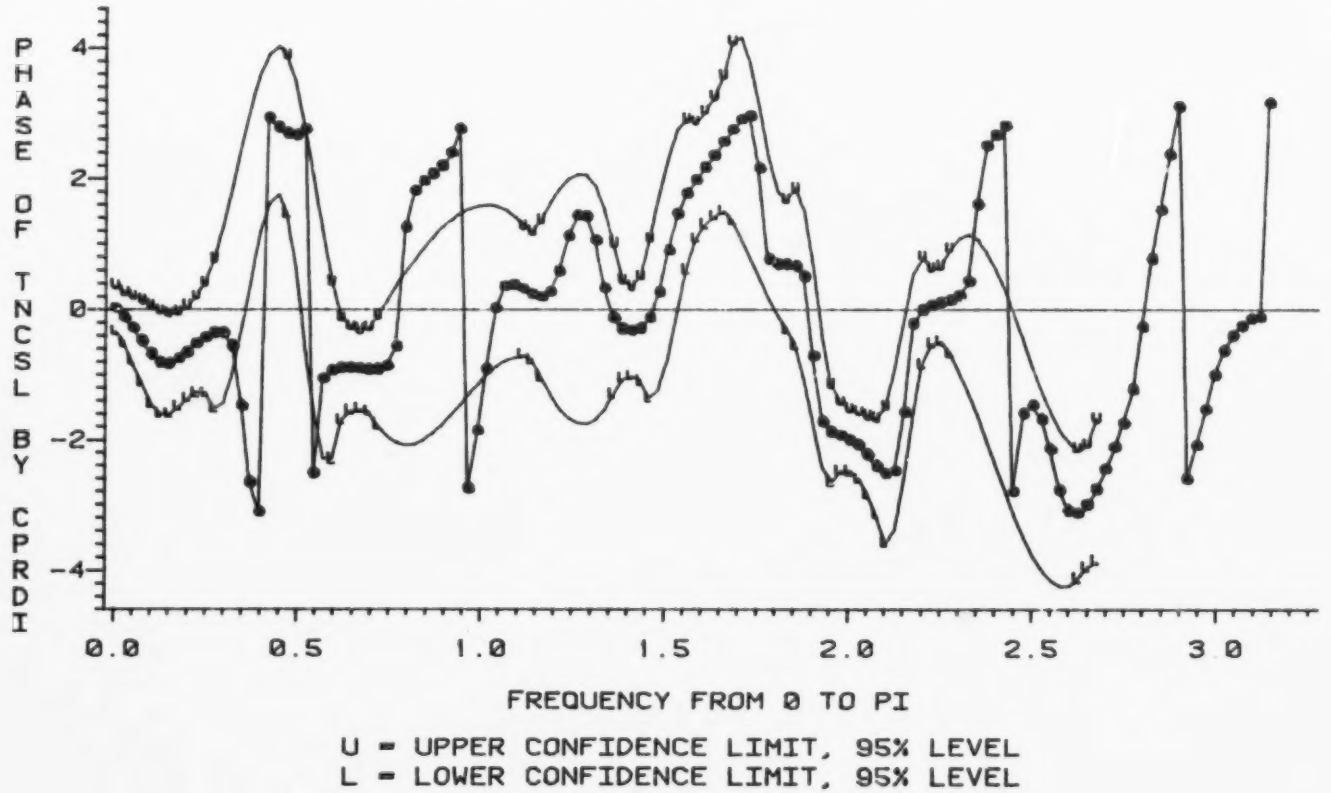


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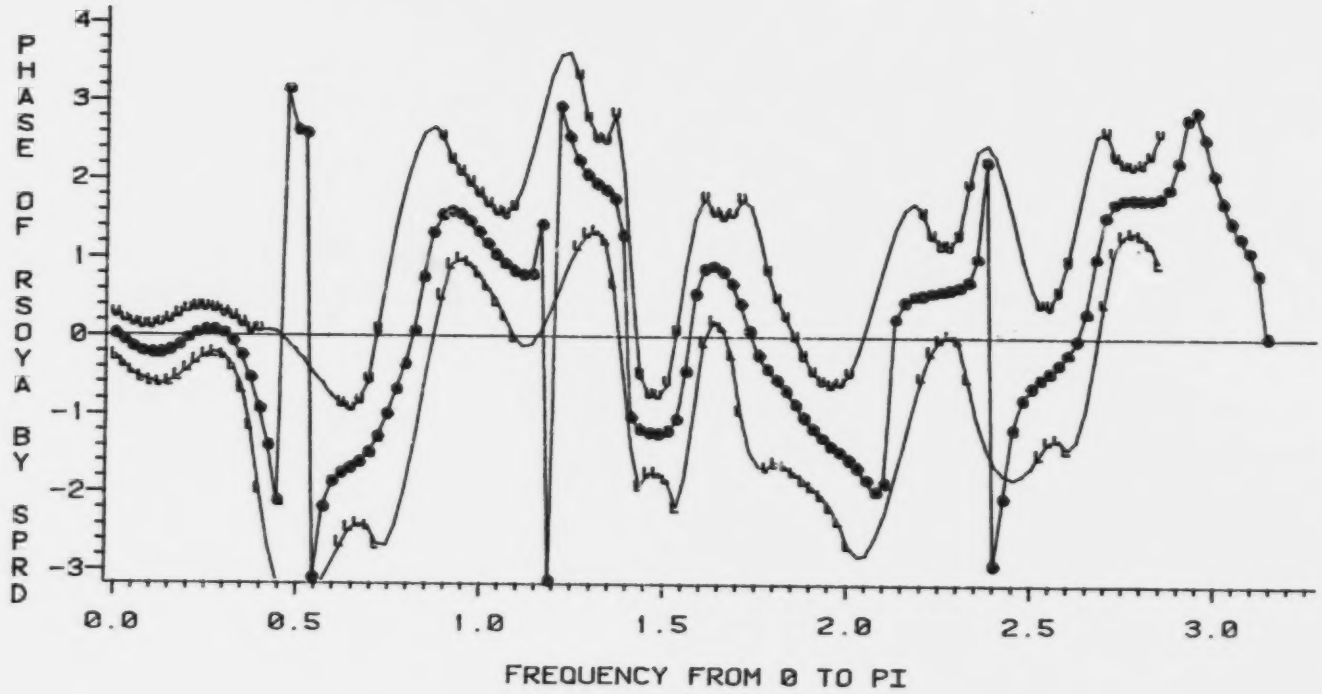
Figure 6.6 PHASE OF WEEKLY CHANGES IN PRICES AND NEW EXPORT SALES OF SOYBEANS



U = UPPER CONFIDENCE LIMIT, 95% LEVEL
L = LOWER CONFIDENCE LIMIT, 95% LEVEL

phase which are positive. Since adjacent estimates of the phase are correlated (Granger and Hatanaka, p. 103), only every other estimate of the phase is counted. Therefore, with 64 observations, the two-tailed test for this hypothesis, where $\alpha = .05$, is: reject Ho where $Z < -1.96$ or $Z > 1.96$. The results of this test shown in Table 6.4 indicate that the hypothesis of no lag cannot be rejected for the strong efficiency models of wheat, corn and soybeans. This result implies that the hypothesis of strong form efficiency, with respect to new export sales cannot be rejected for the wheat, corn and soybeans futures markets.

The failure to reject the hypothesis of strong form efficiency might be interpreted as adequate evidence for the informational efficiency of futures markets prices in the U.S. grain export system. However, given the potential feedback problem in the strong form model and the presence of statistically significant coherences between daily price changes and export sales reports, the semi-strong form efficiency model was also analyzed.

Semi-Strong Form Efficiency Tests

The semi-strong model for wheat reveals the highest coherences in the short run (at high frequencies). The highest peak in the plot (Figure 6.7), .45, is at a frequency of 2.74 radians corresponding to a time period of two weeks. Since the bandwidth resulting from the use of the Bartlett lag window with 19 lags is .51/, no distinction can be made between the peak at frequency 2.74 and peaks within a band of .5 on either side. Unfortunately, the coherence cannot be estimated for time periods shorter

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1/See Appendix 4 for an explanation of the relationship between the lag window and bandwidth.

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Table 6.4 Mean Phase Estimates and Lag Tests, Strong Form Model

Commodity	Mean Phase	Z
Wheat	-.26	-1.51/
Corn	-.09	-1.251/
Soybeans	-.11	-.751/

1/ No significant lag, 95 percent level.

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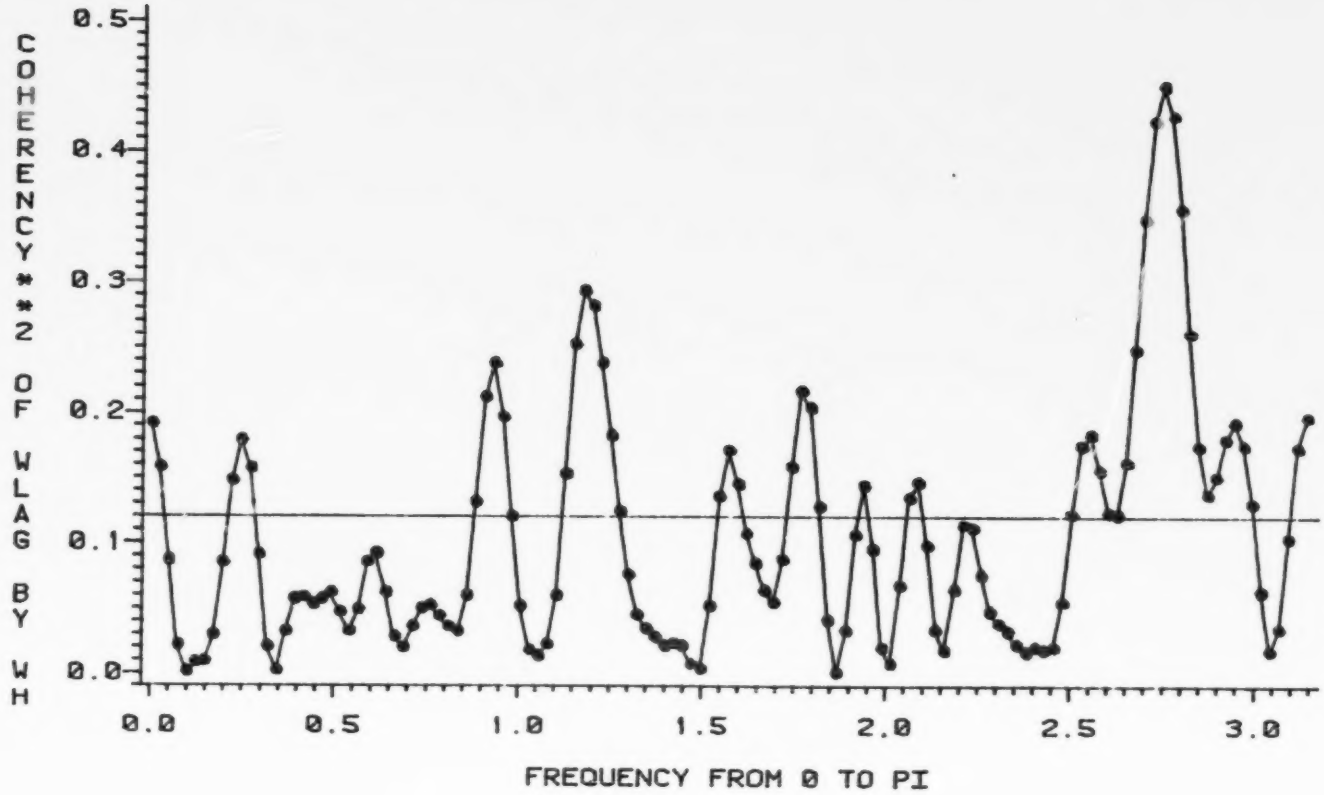
Figure 6.7 COHERENCE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS OF WHEAT



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than twice the interval of the observations. Thus the strength of the relationship between a daily price change and the corresponding export sales report, at one week, cannot be determined.

The corn market reveals a slightly different pattern than the wheat market (Figure 6.8). Although there is a peak in the coherence between price changes and export sales reports at 2.25 weeks there is also another, higher peak between 2.9 and 3.2 weeks. Additionally a high degree of coherence is found in the long run, at time periods greater than six months. The coherence between changes in the price of the near soybean future and reports of new soybean export sales, behaves in a fashion similar to the coherences for the same variables in the corn market. As shown in Figure 6.9, coherence peaks at frequencies corresponding to 2.3, 3.1 and 2.8 weeks.

In order to better understand the pattern of market price adjustment to public information, the lag structure of these relationships must be analyzed. The mean phase of wheat export sales reports, by the corresponding daily price change (Figure 6.10) is -.24, very close to zero. Estimates of the phase oscillate around zero, indicating no lead or lag between these two time series. Phase plots for the corn and soybean markets, shown in Figures 6.11 and 6.12, also appear to oscillate around zero indicating no leads or lags. The confidence limits plotted around the point estimates of the phase reveal the affect of changes in the coherence on these estimates.

Additionally, a non-parametric sign test (Granger and Hatanaka, pp. 103-104) was used to test the hypothesis that the expected value of the phase is zero, or that the

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Figure 6.8 COHERENCE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS OF CORN

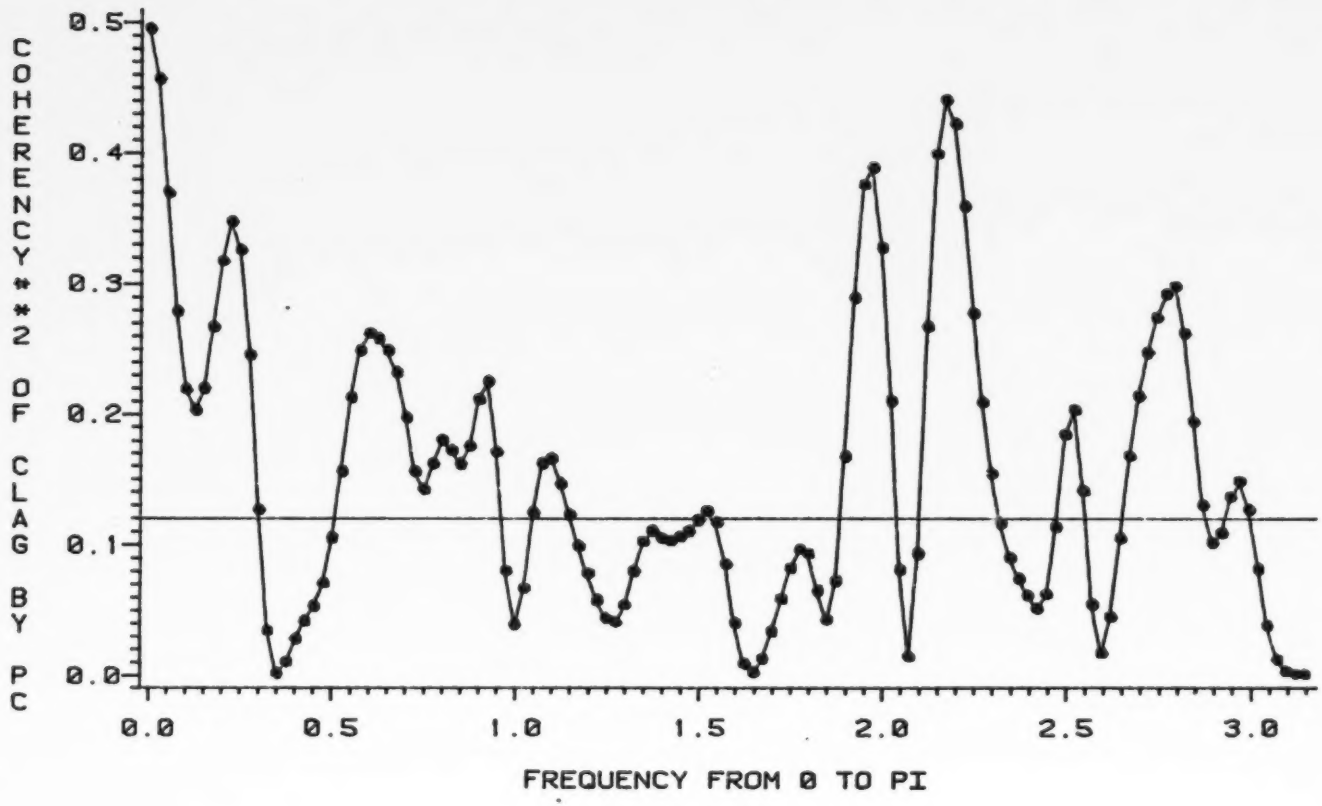

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Figure 6.9 COHERENCE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS OF SOYBEANS

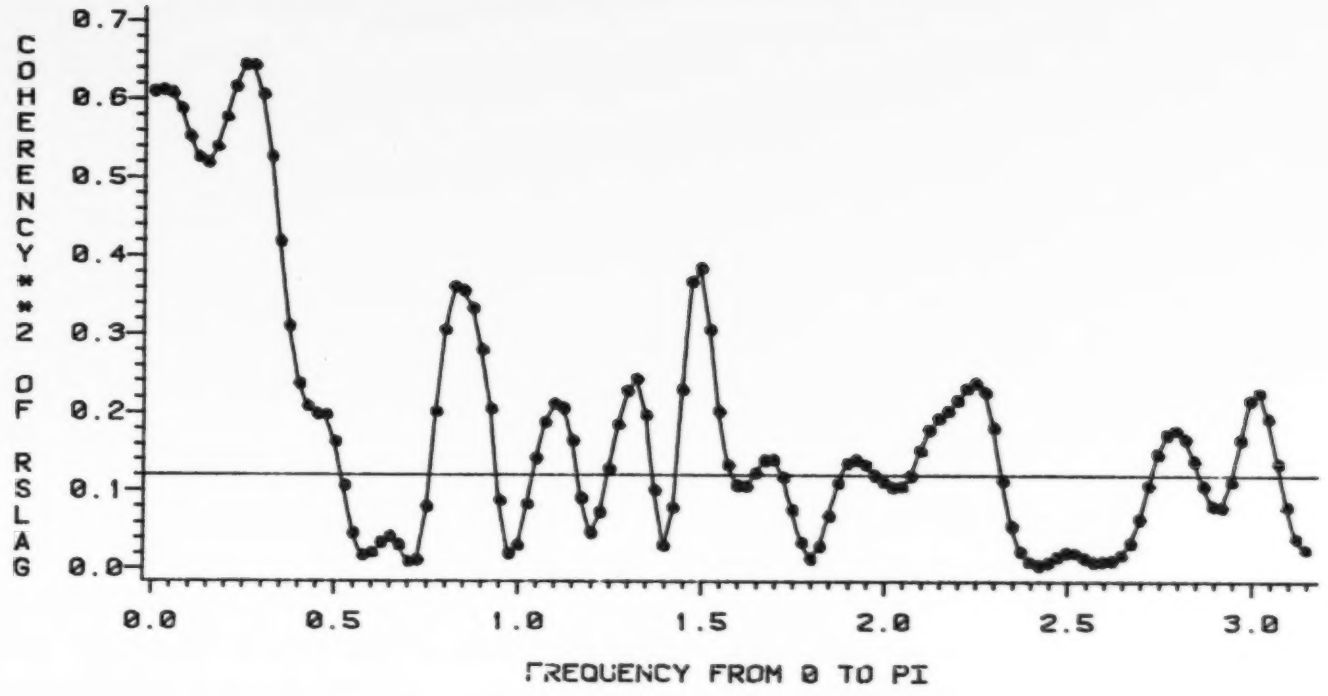
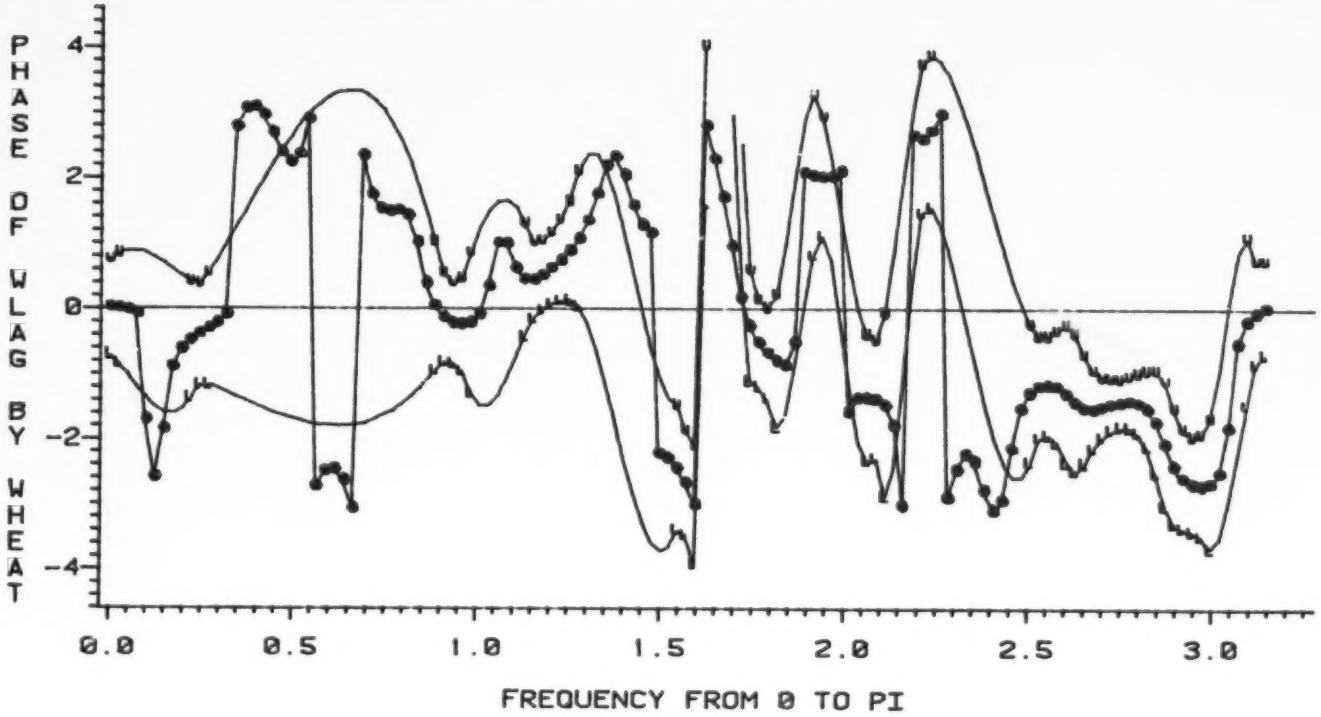


Figure 6.10 PHASE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS WHEAT



U = UPPER CONFIDENCE LIMIT, 95% LEVEL
L = LOWER CONFIDENCE LIMIT, 95% LEVEL

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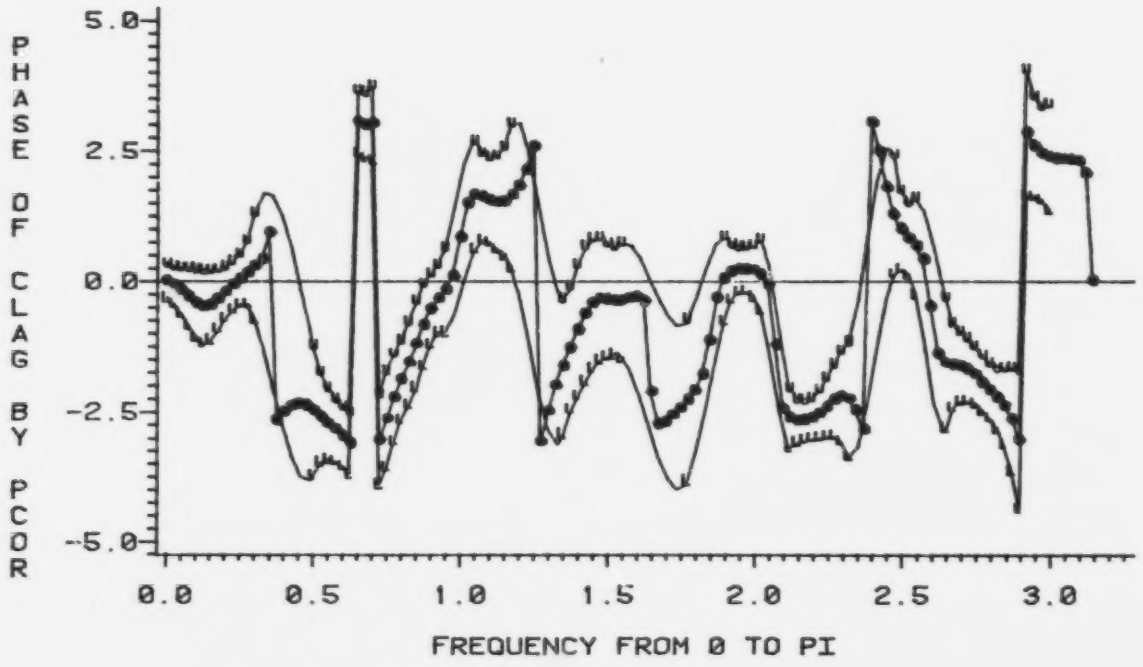
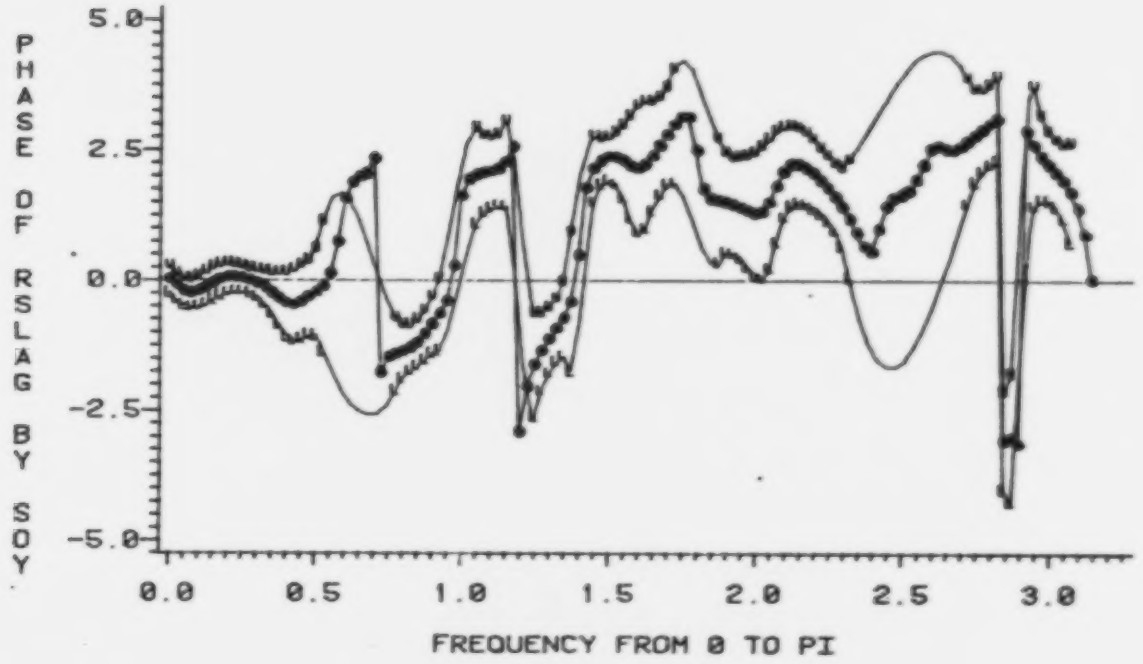
Figure 6.11 PHASE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS CORN



U = UPPER CONFIDENCE LIMIT, 95% LEVEL
L = LOWER CONFIDENCE LIMIT, 95% LEVEL

Figure 6.12 PHASE OF DAILY CHANGES IN PRICES AND EXPORT SALES REPORTS SOYBEANS



U = UPPER CONFIDENCE LIMIT, 95% LEVEL
L = LOWER CONFIDENCE LIMIT, 95% LEVEL

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probability of a positive (or negative) value of the phase is .5. The results of this test, shown in Table 6.5, indicate that the hypothesis of no lag cannot be rejected for the semi-strong efficiency models of wheat, corn and soybeans. These hypothesis tests imply that wheat, corn and soybean futures markets display semi-strong form efficiency with respect to information about grain export sales.

Weak Form Efficiency Tests

The weak form of the efficient market hypothesis specifies that current market hypothesis specifies that current price discount all information contained in past prices. This model implies that price changes represent a random walk, or a white noise process as shown in equation 6.1:

$$6.1. \quad P_t - P_{t-1} = \varepsilon_t$$

Where: $t = i, \ldots, n$

$E(\varepsilon_t) = 0$

$Var(\varepsilon_t) = {}^{2}$

$E(\varepsilon_t, \varepsilon_{t-j}) = 0 \; \forall \; i \neq 0$

The random walk hypothesis can be applied to daily price changes, or to changes over longer intervals (Labys and Granger). For the purposes of this analysis weekly price differences were used for the five-year period between June 1975 and June 1980. The mean price changes for all three commodities are not significantly different from zero (Table 6.6), a condition required by the random walk hypothesis. Other summary statistics, calculated using S.A.S. (Statistical Analysis System) are also presented in Table 6.6.

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Table 6.5 Mean Phase Estimates and Lag Tests Form Model

Commodity	Mean Phase	Z
Wheat	-.24	-1.25[1]/
Corn	-.59	-1.75[1]/
Soybeans	.18	1.25[1]/

1/ No significant lag, 95 percent level.

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Table 6.6 Summary Statistics for Weekly Price Changes of Wheat, Corn and Soybeans (1975 to 1980)1/

Variable	n	Mean	t	Variance	Kurtosis
Wheat	258	.407	.472/	191.81	1.466
Corn	258	.095	.212/	54.84	2.026
Soybeans	258	.481	.272/	840.26	1.313

1/ The change from Monday to Monday in the closing price (cents/bu) of the near future on the Chicago Board of Trade was calculated using data provided by the CFTC.

2/ Not significantly different from zero at the 95 percent level where t(.05/2; 257) = 1.96.

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The time series of price changes were tested to determine if they differed from a series generated by a random or white noise process using the spectral analysis procedure available on the S.A.S. system (S.A.S., p. 381). The results of the white noise test are shown in Table 6.7. At the 99 percent level of significance, the null hypothesis, that weekly changes in futures prices are a random walk, cannot be rejected for any of the three commodities. Nor is the random walk hypothesis rejected for wheat or soybean price changes at the 95 or 90 percent levels of significance.

Thus, the results of these white noise tests indicate that futures markets for wheat and soybeans at the Chicago Board of Trade are efficient in a weak form sense. Although the evidence for the corn market is not as strong, it does not appear possible to reject the hypothesis that it too is weakly efficient.

Conclusions and Implications

Conclusions

The analysis of pricing efficiency in the futures markets for wheat, corn and soybeans, the central markets for the U.S. grain export system, leads to the following conclusions:

1. Statistically significant relationships exist between price changes and information about export sales in all three markets.

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Table 6.7 White Noise Tests for Weekly Price Changes[1] in Wheat, Corn and Soybeans (1975 to 1980)

	Fisher's Kappa[2]	Critical Value for Kappa[3]		
		99%	95%	90%
Wheat	6.6580	8.882	7.378	6.711
Corn	8.3251	8.882	7.378	6.711
Soybeans	5.5436	8.882	7.378	6.711

1/ The change from Monday to Monday in the closing price (cents/bu) of the near future on the Chicago Board of Trade. Source: CFTC.

2/ As defined in equation 6.28:

$$\text{Kappa} = \frac{I_n(L)}{\frac{I}{m}\sum_{n=1}^{m} I_n(\omega)}$$

- the ratio of the largest periodogram ordinate to the average value of the periodogram.

3/ Wayne A. Fuller, Introduction to Statistical Time Series. New York: Wiley, 1976, p. 284.

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2. The hypothesis of semi-strong form pricing efficiency cannot be rejected for the U.S. grain export system.

3. The hypothesis of strong form pricing efficiency cannot be rejected for the U.S. grain export system.

4. Wheat, corn and soybean markets display weak form pricing efficiency, i.e. the random walk hypothesis is not rejected.

An interesting paradox results from conclusions two and three; if a market discounts insider information as strong form efficiency implies, then the markets should not respond to the public release of this information at a later date. Why should grain futures markets respond twice to the same information? One possible explanation for this paradox is that this analysis has not identified the true lag structure of the strong form relationship because of feedback, the simultaneous determination of new export sales and prices. If this were the case, an unidentified lag of price changes behind export sales might exist in the strong form pricing efficiency for the U.S. grain export system.

However, there is an alternative explanation for the coincidence of strong and semi-strong form efficiency in this analysis. At the time export sales are made futures market participants form subjective estimates of these sales. The market rapidly, aggregates and discounts this imperfect information and a price change is realized. Upon release of the export sales report, market participants re-evaluate their positions, and a further price adjustment

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takes place. This explanation of the paradox also implies that the U.S. grain export is not strong form efficient. The market cannot achieve perfect efficiency by aggregating imperfect information.

There is no particular reason to expect markets operating in an uncertain world with imperfect and costly information to display pure strong form efficiency. However, even in this situation, the initial price response to information about new export sales should be an unbiased estimate of the response to the true information released in the export sales report. If this is not the case, then the potential for returns to insider information exists. Consistent underestimates (or overestimates) of export sales by traders prior to the release of the export sales report would result in a bias in the price response to the report. An upward bias in price changes following the report release would indicate consistent underestimates of new export sales. This is the performance deficiency implied by Congressman Smith's statement (Chapter 5).

A simple statistical test for bias in the price response to the export sales report is to examine the hypothesis that the mean daily price change ($\mu\rho$) following the report release is zero:

$$H_o : \mu P = 0$$

$$H_A : \mu P \neq 0.$$

Results of the t tests of this hypothesis, shown in Table 6.8, indicate that the mean daily price changes for wheat, corn and soybeans are not significantly different from zero

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Table 6.8 Test for Bias in Price1/ Responses to Export Sales Reports, 1975-1980

Commodity	Mean Price Change	t
	(cents/bu)	
Wheat	.053 2/	.15
Corn	-.018 2/	-.11
Soybeans	.430 2/	.63

1/ Change in the closing price of the near future (C.B.T.) from the day prior to report release to the first market day following report release.

2/ Not significantly different from zero at the 95 percent level.

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at the 95 percent level. Thus no bias in the price response to export sales reports is indicated.

The final conclusion of this analysis is that the central markets of the U.S. grain export system are semi-strong efficient. Additionally, although these markets do not display pure strong form efficiency, prices do respond to information about export sales prior to the export sales report release. This response appears to result from an unbiased estimate of the true value of export sales by the market. These conclusions may be meaningful to the economist, but what are its implications for participants in the grain export system, policymakers and the public? The answer to this question lies in the relationship between these conclusions concerning pricing efficiency and the organization of the system.

Pricing Efficiency and the Organization of the U.S. Grain Export System

The structure of the grain export industry and the protection of proprietary information by individual firms may in part account for the lack of strong form pricing efficiency in the U.S. grain export system. However, the possibility of sustained returns to inside information in this market appears unlikely. New export sales explain a very small part of the variance in price changes. Additionally, no single firm knows the volume of total new export sales until the report is released. Given these facts, it seems likely that an individual firm will be able to take advantage of the market, only under very unusual circumstances. The grain sales to the U.S.S.R. in the early 1970's may be such an example. However, changes in

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government reporting requirements and trade agreements with the U.S.S.R. make a reoccurrence of this scenario unlikely.

These government policy changes undoubtedly improved the informational efficiency of the grain export system. A GAO survey (GAO, ID-76-87, pp. 46-51) of exporter attitudes to the Export Sales Reporting System (E.S.R.S.) found that 69.8 percent of the respondents felt the system was needed. Over 50 percent of these exporters also found information in the reports to be useful or very useful. The reporting requirements do cost exporters time and money. Thus, given the attitudes of exporters, it seems plausible that improvements in informational efficiency resulting from E.S.R.S., resulted in a net gain to exporters as well as society.

This study indicates that the Export Sales Reporting System has improved market performance, as Congress hoped it would. Further gains in informational efficiency could be made by reducing the lag between the time sales are made and the report release date. Such a change was made in June of 1980, however, not enough data exists to evaluate the impact of this change.

Real world markets do not function in a vacuum or without friction and the central markets of the U.S. grain export system are no exception. While privately held information about new export sales is imperfectly discounted, these markets adjust upon public release of this information. Government regulation, in the form of the Export Sales Reporting System, seems to function as a lubricant. There can be little doubt, that this improves pricing efficiency. While past deficiencies in the pricing efficiency of the U.S. grain export system have generated

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changes in the system's organization, current performance is in part a function of the system's organization. Decision makers, in both the grain export industry and the government, should be aware that the relationship between organizations and performance is a two-way street.

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References - Chapter 6

Fuller, Wayne A. Introduction to Statistical Time Series. New York: John Wiley, 1976.

Granger, C.W.S. and Hatanaka, M. Spectral Analysis of Economic Time Series. Princeton, N.J.: Princeton Univ. Press, 1964.

Labys, Walter C. and Granger, C.W.J. Speculation, Hedging and Commodity Price Forecasts. Lexington, Mass.: Heath, 1970.

S.A.S. Institute. SAS User's Guide. Raleigh, N.C.: S.A.S. Institute, Inc., 1979.

U.S. Department of Agriculture, Foreign Agricultural Service. U.S. Export Sales. Weekly 1975-1980.

U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports. Report to the Congress, ID-76-87, May 2, 1977.

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CHAPTER 7

SUMMARY AND CONCLUSIONS

Exports of grains and oilseeds are of great importance to the agricultural sector and to the U.S. economy as a whole. Concerns, about the pricing efficiency and market structure of the system that moves these exports, has grown along with the volume of grain over the last decade. The grain export industry has been perceived as a cartel of major multinational corporations, not subject to the discipline of market forces or effective government regulation. Thus, it has been suggested that these firms manipulate the market at the expense of producers and consumers.

A scarcity of economic research, addressing these perceived problems stimulated this study. The purpose of this paper is to address some of the unanswered questions about the U.S. grain export system: How is it organized? How is the system changing? and How does the system perform? The four specific research objectives were:

(1) describe and analyze the organization of the U.S. grain export system;

(2) define economic performance measures for perceived performance problems;

(3) conduct an empirical analysis using these measures;

(4) evaluate the implications of these results.

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Information about the organization of the U.S. grain export system was collected from a variety of primary and secondary sources. These included interviews with government officials and industry representatives, as well as government and trade publications. Using this information the organization of the grain export system was described and analyzed, with special attention to industry structure, market institutions and the role of the government.

This analysis revealed lower levels of concentration than those generally attributed to the export business, a healthy rate of entry to the industry and the presence of central market institutions (futures markets) providing for competitive price discovery. The popular conception of the export industry as one controlled by a cartel of major multinational corporations, is, not only an oversimplified view, but a misconception. However, this analysis was not sufficient to address the most commonly perceived market performance problem in the U.S. grain export system, central market pricing efficiency. Do the futures markets efficiently aggregate information about export sales into price? A methodology for the economic analysis of this question was needed. A search of the literature suggested that the efficient markets hypothesis might provide a suitable framework for the analysis. The efficient market hypothesis states that prices in an efficient market reflect all available information. Three levels of efficiency have been proposed:

(1) weak form efficiency - current price discounts all information contained in past prices;

(2) semi-strong form efficiency - current price discounts all public information;

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(3) strong form efficiency - current price discounts all information.

Models of price behavior in the U.S. grain export system were developed for these three levels of efficiency. In the weak form model price changes are a random walk. The semi-strong form model specifies price changes as a function of public information about new export sales, U.S.D.A.'s export sales report. This same information, prior to its release, drives price changes in the strong form model.

The actual behavior of prices in the futures markets (the central markets for the U.S. grain export system) was compared to these hypothesized forms of price behavior using spectral and cross spectral analysis. The economic analysis of pricing efficiency in the U.S. grain export system resulted in the following conclusions:

(1) the hypothesis of weak form efficiency cannot be rejected;

(2) the hypothesis of semi-strong form efficiency cannot be rejected;

(3) the hypothesis of strong form efficiency cannot be rejected.

The second and third conclusions present a paradox; if private information about export sales is discounted by the market there should be no response to public release of this information. These results imply that initial price response to imperfect information is followed by some

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further adjustment upon public release of the correct information about export sales.

This analysis reveals a high degree of pricing efficiency in the U.S. grain export system. This result, combined with the analysis of the system's organization, reveals a picture of the U.S. grain export system much different from the one found in Congressional hearings and popular journals. However, this study is not the final word on the U.S. grain export system. Fruitful areas for future research include the nature of technological and institutional innovation in this marketing system. Additionally, an evaluation of changes made in the structure of U.S.D.A.'s Export Sales Reporting System in 1980, and its contribution to improving information flow in the system, must await further data.

The U.S. grain export system moves large volumes of grain from the farm to ocean vessel. The system also handles a tremendous flow of information and generates price signals which allocate resources and distribute economic regards. While this decentralized market system does not function with perfect theoretical efficiency, Adam Smith's invisible hand is still at work in the U.S. grain export system.

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BIBLIOGRAPHY

Abbott, Phillip C. "Modeling the International Grain Trade with Government Controlled Markets, Amer. J. Agr. Econ., Vol. 61, No. 1 (Feb. 1979), 22-31.

Alaouze, Chris M., Watson, A.S. and Sturgess, N.H. "Oligopoly Pricing in the World Wheat Market," Amer. J. Agr. Econ., Vol. 60, No. 1 (1978), 173-178.

Bawden, D. Lee. "An Evaluation of Alternative Spatial Models," J. Farm Econ., Vol. 46, No. 5 (1964), 1365-1711.

Bressler, Raymond G. and King, Richard A. Markets Prices and Interregional Trade. Raleigh, N.C.: Norman Weathers Printing Co., 1978.

Brewster, John M. A Philosopher Among Economists. Philadelphia: J.T. Murphy, 1970.

Brownlee, O.H. "Marketing Research and Welfare Economics," J. Farm Econ., Vol. 30, No. 1 (Feb. 1948), 55-68.

Burbach, Roger. "The Great Grain Robbery," The Progressive (July 1976), 24-27.

Caves, Richard. American Industry: Structure, Conduct, Performance. Englewood Cliffs, N.J.: Prentice Hall, 1967.

Caves, Richard. "Organization, Scale and Performance in the Grain Trade," Food Research Institutes Studies, Vol. 16, No. 3 (1977-78).

Cochrane, Willard W. "The Market as a Unit of Inquiry in Agricultural Economics Research," JFE (Feb. 1957).

Conklin, Neilson C., Wilbert, Gerhard and Dahl, Reynold. "Pricing of Grain Exports and the Role of Futures Markets," Minnesota Agricultural Economist, No. 614 (Dec. 1979), Agricultural Extension Service, University of Minnesota.

Cook, Michael L. and Wilson, Shasi. "Methodological Issues in Examining Export Market Performance: The Argentinian Case." Paper presented at the AAEA annual meetings, Urbana, Illinois, 1980.

BEST DOCUMENT AVAILABLE

Cox, Charles C. "Futures Trading and Market Information," Jour. of Polit. Econ., Vol. 84, No. 6 (1976), 1215-1237.

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work," J. Fin. 25, 383-417.

Figelewski, Stephen. "Market Efficiency With Heterogeneous Information," Jour. of Polit. Econ., Vol. 86, No. 4 (1978), 581-597.

Fornari, Harry. Bread Upon the Waters. Nashville: Amora Publish, 1973.

Fuller, Wayne A. Introduction to Statistical Time Series. New York: John Wiley, 1976.

Gilmore, Richard. "Grain in the Bank," Foreign Policy, No. 38 (Spring 1980), 168-181.

Granger, C.W.S. and Hatanaka, M. Spectral Analysis of Economic Time Series. Princeton, N.J.: Princeton Univ. Press, 1964.

Grennes, Thomas, Johnson, Paul R. and Thursby, Marie. The Economics of World Grain Trade. New York: Praeger, 1978.

Groenewegen, J.R. and Cochrane, W.W. "A Proposal to Further Increase the Stability of the American Grain Sector," Amer. J. Agr. Econ., Vol. 62 (Nov. 1980), 806-811.

Grossman, Sanford J. and Stiglitz, Joseph E. "Information and Competitive Price Systems," Amer. Econ. Rev., Vol. 66, No. 2 (May 1976), 246-253.

Hathaway, Dale. "Trade and Development Issues for the 1980's." Presented at the 1981 Agricultural Outlook Conference Session No. 34, Nov. 19, 1980.

Hayami, Jujuo and Peterson, Willis. "Social Returns to Public Information Services: Statistical Reporting of U.S. Farm Commodities," Amer. Econ. Rev., Vol. 62, No. 1 (March 1972), 120-130.

BEST DOCUMENT AVAILABLE

Heifner, Richard, Kahl, Kandice and Deaton, Larry. "A Study of Relationships Between Large Export Sales and Futures Trading." Appendix to Export Grain Sales. Hearing before the Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business. House 96th Congress, 1st session. June 11, 1979.

Hayek, F.A. "The Use of Knowledge in Society," Amer. Econ. Rev. (Sept. 1945), 519-530.

Helmuth, John W. Grain Pricing, Econ. Bulletin No. 1. Washington, D.C.: C.F.T.C., Sept. 1977.

Henderson, James M. and Quandt, Richard E. Micro Economic Theory: A Mathematical Approach, third edition. New York: McGraw Hill, 1980.

Hirsch, Donald E. Agricultural Exports by Cooperatives. USDA ESCS Farmer Cooperative Research Report No. 5, Aug. 1979.

Howard, James A. "Covering an Export Sale," Cargill Crop Bulletin, Cargill, Inc., March 1981, p. 4.

Jabara, Cathy L. Trade Restrictions in International Grain and Oilseed Markets. USDA ESS Foreign Agricultural Economic Report 162, Jan. 1981.

Journal of Commerce. "Farmers Export Agrees to Sell Texas Elevator," Wed., April 15, 1981, p. 5.

Journal of Commerce. "Japanese Trade Houses Moving Into U.S. Grain Markets," Thurs., June 18, 1981, p. 9.

Juillerate, Monte E. and Farris, Paul L. Grain Export Industry Organization and Facilities in the United States. Research Progress Report 390. Lafayette, Ind.: Purdue University, Agricultural Experiment Station, 1971.

Knutson, Ronald D., Cook, Michael and Sporleder, Thomas L. Assessment of International Cooperative Coordination. Texas Agricultural Marketing Research and Development Center, Texas A and M University.

Kohlmeyer, Robert W. Cargill, Inc. Interview, June 18, 1981.

Koopmans, L.H. The Spectral Analysis of Time Series. New York: Academic Press, 1974.

BEST DOCUMENT AVAILABLE

Labys, Walter C. and Granger, C.W.J. Speculation, Hedging and Commodity Price Forecasts. Lexington, Mass.: Heath, 1970.

Lamm, R. McFall, Jr. "Market Performance in the U.S. Vegetable Oil Industry: An Application of Simulation for Market Analysis," Amer. J. Agr. Econ., Vol. 58, No. 4 (Nov. 1976), 735-739.

Lamm, R. McFall, Jr. "Economies of Scale in Cottonseed Processing," Agr. Econ. Res., Vol. 31, No. 1 (Jan. 1979).

Leuthold, Raymond M. and Hartman, Peter A. "A Semi Strong Form Evaluation of the Efficiency of the Hog Futures Market: Reply," Amer. J. Agr. Econ. (Aug. 1980), 585-587.

Leuthold, Raymond M. and Hartman, Peter A. "A Semi Strong Form Evaluation of the Efficiency of the Hog Futures Market," Amer. J. Agr. Econ., Vol. 61 (Aug. 1979), 482-488.

Levine, Mark B. The Use of Information for the Price Determination of Grains for Export. Ph.D. Dissertation, Cornell University, 1976.

Losey, Robert L. and Talbott, John C., Jr. "Back on the Track with the Efficient Markets Hypothesis," J. Fin., Vol. 35, No. 4 (Sept. 1980), 1039.

MacAvoy, Paul. "Learning to Love Oligopolies," New York Times, Sept. 28, 1980.

Marion, Bruce W. and Handy, Charles R. Market Performance: Concepts and Measures. USDA ERS Agricultural Economics Report 244. Washington, D.C.: U.S. Government Printing Office, 1973.

Martin, Larry J. "Comparing Performance of Alternative Marketing Systems: A Suggested Approach With Special Reference to the Grain Markets of Canada and the United States." Paper presented at NC-139 technical meeting, Moscow, Idaho, August 1979.

Martin, Larry J. "Comparing International Market Performance: Conceptual and Measurement Issues." Paper presented at the AAEA annual meeting, Urbana, Illinois, July 1980.

BEST DOCUMENT AVAILABLE

McCalla, Alex F. "A Duopoly Model of World Wheat Pricing," J. Farm Econ., Vol. 48, No. 4 (1966), 711-727.

McCalla, Alex F. Discussion of papers presented at the American Agricultural Economics Association meetings, Urbana, Illinois, 1980.

Middents, Melvin J. "Who are the Players in Grain Export Markets?," Cargill Crop Bulletin, Cargill, Inc., Jan. 1981, p. 4.

Morgan, Dan. "The Politics of Grain," The Atlantic 264 (July 1980), 29-34.

Morgan, Dan. Merchants of Grain. New York: Viking Press, 1979.

Oleson, Brian T. Price Determination and Market Share Formation in the International Wheat Market. Unpublished Ph.D. Thesis, Graduate School, University of Minnesota, 1979.

Panton, Don B. "A Semi Strong Form Evaluation of the Efficiency of the Hog Futures Market: Comment," Amer. J. Agr. Econ., Vol. 62 (Aug. 1980), 584.

Parker, Russell C. and Connor, John M. "Estimates of Consumer Loss Due to Monopoly in the U.S. Food Manufacturing Industries," Amer. J. Amer. Econ., Vol. 61, No. 4, 626-639.

Pasour, E.C., Jr. "A Semi Strong Form Evaluation of the Efficiency of the Hog Futures Market: Comment," Amer. J. Agr. Econ., Vol. 62 (Aug. 1980), 581-583.

Pauli, Peter B. "Basis Pricing Complicates Export Reporting," Foreign Agriculture, USDA, FAS, June 30, 1975.

Quirk, James and Saposhik, Rubin. Introduction to General Equilibrium Theory and Welfare Economics. New York: McGraw Hill, 1968.

Reynolds, Bruce. Producers Export Company: The Beginning of Cooperative Grain Exporting. USDA ESCS Farmer Cooperative Report No. 15, Jan. 1980.

Rosson, C. Parr, III and Cook, Michael L. "Methodological Issues in Examining Export Market Performance: The Australian Case." A paper presented at the AAEA annual meetings, Urbana, Illinois, 1980.

BEST DOCUMENT AVAILABLE

Rutledge, D.J.S. "A Note on the Variability of Futures Prices," Rev. Econ. and Stat., Vol. 58, No. 1 (1976), 118-120.

S.A.S. Institute. SAS User's Guide. Raleigh, N.C.: S.A.S. Institute Inc., 1979.

Samuelson, Paul A. "Proof that Properly Anticipated Prices Fluctuate Randomly," Indus. Man Rev. 6 (Spring 1965), 41-49.

Samuelson, Paul A. "Is Real-World Price a Tale Told by the Idiot of Chance?," Rev. Econ. and Stat., Vol. 58, No. 1 (1976), 120-123.

Scherer, F.M. Industrial Market Structure and Economic Performance, first edition. Chicago: Rand-McNally, 1970.

Schmitz, Andrew and McCalla, Alex F. "Grain Marketing Systems: The Case of the United States Versus Canada," Amer. J. Agr. Econ., Vol. 61, No. 2 (May 1979), 199-212.

Schuh, G.E. "Post Keynesian Economics and Agriculture: Discussion," Amer. J. Agr. Econ., Vol. 62, No. 2 (May 1980), 328-330.

Schumpeter, Joseph. Capitalism, Socialism and Democracy. New York: Harper and Row Publishers, Inc., 1942.

Shaffer, James D. "Food System Organization and Performance: Toward a Conceptual Frame Work," Amer. J. Agr. Econ., Vol. 62, No. 2 (May 1980), 310-318.

Sosnick, S.H. "Operational Criteria for Evaluating Market Performance," Market Structure Research (Paul Farris ed.). Ames, Iowa; Iowa State University Press, 1964.

Steiner, Robert L. "The Prejudice Against Marketing," Journal of Marketing, Vol. 40 (July 1976), 2-9.

Stevenson, Richard A. and Bear, Robert M. "Commodity Futures: Trends or Random Walks?," J. Fin. (March 1970), 65-81.

Stigler, George J. The Organization of Industry. Homewood, Ill.: Richard D. Irwin, 1968.

BEST DOCUMENT AVAILABLE

Telser, Jester G. "Futures Trading and the Storage of Cotton and Wheat," Jour. of Polit. Econ., Vol. LXVI, No. 3 (June 1958).

Thompson, Sarahelen R. and Dahl, Reynold P. The Economic Performance of the U.S. Grain Export Industry. Tech. Bulletin 325, St. Paul, Minnesota, Agricultural Experiment Station, University of Minnesota, 1979.

Thurston, Stanley K., Phillips, Michael J., Haskell, James E. and Volkin, David. Improving the Export Capability of Grain Cooperatives, FCS-34. USDA Farmer Cooperative Service. Washington, D.C.: U.S. Government Printing Office, 1976.

Tomek, William G. "Speculation and Price Behavior on Commodity Markets: A Survey." Paper prepared for Chicago Board of Trade's Research Seminar on Speculation, Nov. 6 and 7, 1980.

Tomek, William G. and Gray, Roger W. "Temporal Relationships Among Prices on Commodity Futures Markets: Their Allocative and Stabilizing Roles," Amer. J. Agr. Econ., Vol. 52, No. 3 (Aug. 1970).

U.S. Congress, House Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business. Export Grain Sales: Hearing, 96th Congress, 1st session, June 11, 1979.

U.S. Congress, Senate Subcommittee on Multinational Corporations of the Committee on Foreign Relations. International Grain Companies: Hearing, 94th Congress, 2nd session, June 18, 23 and 24, 1976.

U.S. Congress, Office of Technology Assessment. Food Information Systems: Hearings, 94th Congress, 1st and 2nd sessions, Sept. 24, 25 and Dec. 10, 1975, Feb. 4, 1976.

U.S. Department of Agriculture, Foreign Agricultural Service. U.S. Exports Sales. Weekly 1975 - 1980.

U.S. Department of Commerce. Census of Wholesale Trade, 1977, Subject Series, Establishment Size and Firm Size. Bureau of Census, 1980.

U.S. General Accounting Office. Issues Surrounding the Management of Agricultural Exports. Report to the Congress, ID-76-87, May 2, 1977.

BEST DOCUMENT AVAILABLE

U.S. General Accounting Office. Grain Marketing Systems in Argentina, Australia, Canada, and the European Economic Community; Soybean Marketing System in Brazil. ID-76-61, 1976.

U.S. General Accounting Office. Inventory of Federal Food, Nutrition and Agriculture Programs. CED-79-125, Sept. 11, 1979.

Willig, Robert D. "Consumer's Surplus Without Apology," Amer. Econ. Rev., No. 66 (Sept. 1976), 589-597.

Wilson, W.W. and Anderson, D.E. "The Canadian Grain Marketing System." A paper presented at American Agricultural Economics Association annual meetings, Urbana, Illinois, 1980.

Working, Holbrook. "Theory of the Inverse Carrying Change of Futures Markets," J. Farm Econ., Vol. 30 (1948), 1-28.

Working, Holbrook. "The Investigation of Economic Expectations," Amer. Econ. Rev. (May 1949), 150-166.

Working, Holbrook. "A Theory of Anticipatory Prices," Amer. Econ. Rev., Proceedings (May 1958), 188-199.

Working, Holbrook. "New Concepts Concerning Futures Markets and Prices," Amer. Econ. Rev., Papers and Proceedings (May 1961), 160-163.

Wright, Bruce H. and Krause, Kenneth R. "Foreign Direct Investment in the U.S. Grain Trade," Report to the Congress: Foreign Direct Investment in the United States, Vol. 4, Appendix E, U.S. Department of Commerce, April 1976.

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APPENDIX 1

GRAIN EXPORT INTERVIEW GUIDELINE

Firm Name:

Representative:

I. Firm Organization

A. How is your firm organized?

1. Sole proprietorship
2. Private corporation
3. Partnership
4. Public corporation
5. Cooperative
6. Other

B. How would you describe your firm? (e.g. multinational trader, flour miller)

C. Is your firm U.S. or foreign based?

D. Is your firm a subsidiary or an affiliate of another firm?

E. What year was your firm founded?

F. What year did your firm begin exporting of commodities?

G. Which agricultural commodities does your firm export? (Please rank them in order of importance.)

1. Wheat
2. Rice
3. Corn
4. Other feed grains
5. Soybeans
6. Soybean meal
7. Soybean oil
8. Other oil seeds and products
9. Other Ag. commodities

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H. What types of non-export activities is your firm engaged in?
   1. domestic grain merchandising
   2. food or food processing
   3. other agriculture related activities
   4. non-agricultural activities.

I. Approximately what proportion of your business involves the export of agricultural commodities?
   1. If your firm is a subsidiary of another firm approximately what proportion of the parent firm's business involves the export of agricultural commodities?

J. Which of the following domestic grain handling facilities does your firm own or control?
   1. country elevators
   2. subterminal elevators
   3. interior terminal elevators
   4. river terminal elevators
   5. port elevators
   6. rail cars
   7. barges

K. Does your firm own foreign grain handling facilities?

L. Does your firm have foreign offices?

M. Does your firm have other foreign agents?

N. Does your firm have a formal information and analysis system?

O. Please rank the following sources of market information in order of usefulness.
   1. company employees
   2. wire services
   3. trade publications
   4. trade associations
   5. private forecasting services

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6. government agencies
7. other sources

II. Contracts and Pricing

A. Approximately what proportion of your firm's sales are
   1. free alongside
   2. free on board
   3. cargo insurance freight
   4. other

B. Approximately what proportion of your firm's sales are
   1. fixed price
   2. unfixed price

C. Do these proportions vary between state traders and private importers?

III. Risk Management

A. How do you perceive the following risks in grain exporting?

	Very Great Risk	Great Risk	Some Risk	Little Risk	No Risk
Quality risk					
Price risk					
Basis risk					
Logistical risk					
Foreign exchange risk					
Financial risk					
Political risk					

B. What other important risks do you assume in grain exporting?

C. Please rank the following in order of usefulness for the management of price and/or basis risk.
   1. U.S. futures markets
   2. other futures markets

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3. European resellers market
4. other forward cash markets

D. Please describe a hypothetical hedge in each of the above markets.

IV. Industry Organization

A. How would you define a grain exporting firm?
1. A firm with the capacity to load an ocean going vessel.
2. A firm who makes a sale to a foreign buyer.

B. How would you characterize the degree of competition within the grain export industry on a "scale" of 1 to 5 where 1 is monopolistic and 5 is purely competitive? Please briefly justify your choice.

C. How would you characterize the degree of competition in the grain export industry now as compared to 1970?
1. much more
2. more
3. the same
4. less
5. much less

D. What major changes in industry organization have occurred since 1970? e.g. changes in form numbers, market shares, firm "types" (coops, Japanese traders, etc.)

E. What are the important barriers, if any, to the entrance of new firms in this industry?

V. Export System Efficiency

A. Are there any major inefficiencies in moving grain to export positions? (e.g. transportation bottlenecks or other cost increasing problems)

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B. Are any export facilities underutilized? If so where?

C. Are export facilities built at the optimum (minimum cost/unit) scale?

VI. The Government's Role in the Export System

A. How often do you deal with these in your export activities?

	Very Often	Often	Seldom	Never
1. U.S.D.A.				
a. For. Agric. Service				
i. Export Sales Div.				
ii. Other				
b. Federal Grain Inspection Service				
c. Other				
2. Commodity Futures Trading Commission				
3. Interstate Commerce Commission				
4. Occupational Safety and Health Admin.				
5. Environmental Protection Agency				
6. Department of Justice (Corrupt Practices Act)				
7. Others				

B. Do regulations or programs of these agencies overlap or conflict? If so how?

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C. Which programs or regulations are beneficial to your firm? To the industry as a whole?

D. Which programs or regulations are detrimental to your firm? To the industry as a whole?

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APPENDIX 2

FIRM OPERATIONS AND RISK MANAGEMENT[1/]

The operation of grain merchandising firms in general, and exporters in particular, is a mystery to most people outside the grain trade. The way in which sales are made, contract terms established and risks managed is not well understood. The generally held view of the grain exporter as a merchant earning a "commission" for the handling and movement of grain is an over simplification of his task.

The exporter provides the market with arbitrage and risk management services. In a competitive system these services should result in efficient price discovery and allocation of commodities over time and space. Therefore, before analyzing the pricing efficiency of the grain export system at the market level the way in which the individual firm provides these services must be discovered.

How Grain Export Sales Are Made

Grain exporters generally make contact with importers on the open market, through public or private tenders. On the open market, typified by the London or Rotterdam markets, bids and offers are constantly made by buyers and sellers often through brokers. Grain importers, especially foreign governments, may issue open requests for bids ahead of a final offering date. These public tenders are formal,

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1/ Much of this Appendix is based on a paper by Neilson C. Conklin, Gerhard Wilbert and Reynold P. Dahl, "Pricing of Grain Exports and the Role of Futures Markets," Minnesota Agricultural Economist, No. 614, Agricultural Extension Service, University of Minnesota, 1979.

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and the terms usually specific. Private tenders are somewhat less formal: The buyer invites a few selected exporters to submit offers. Both private firms and governmental entities make use of private tender.

The terms of grain export sales, whether they are made on the open market or through tender, are specified in a legal contract. Several standard contract forms such as the North American Export Grain Association (NAEGA) Contract No. 2, the Grain and Feed Trade Association (GAFTA) contracts, and the Federation of Oils, Seeds, and Fats Association (FOSFA) contracts, have been prepared by industry groups and modified over years of use to meet the needs of the export trade.

Within the general framework of these contract forms, specific terms are agreed on for any particular grain sale. The terms set by the buyer and seller include the quantity and quality of grain, shipping period, origin, destination, delivery terms, price, and payment terms. Delivery terms are generally f.o.b. or c.i.f. When the exporter sells grain f.o.b. (free on board), it means assembling the grain at the export elevator and loading it on a ship provided by the buyer (importer). For a c.i.f. (cost, insurance, freight) sale the exporter (seller) provides the ship, delivers the grain to the importer's destination, and insures the grain enroute.

Nearly all export grain sales are made on forward cash contracts calling for delivery up to a year in advance. If export contracts fix the price of grain, they are called flat price contracts. Exporters are able to quote forward prices even on grain not owned because futures markets are available for pricing and hedging.

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Other contracts stipulate only the basis, which is the relationship to a designated futures price; these are called basis or unpriced contracts. With the latter, the final price of the grain is fixed at the request of the importer some time prior to the delivery date. An example of a grain export sale may clarify how fixed price and basis price contracts work.

On June 1 a wheat importing country calls several grain exporting firms requesting flat price offers for delivery of a soft red wheat. On this same date the price of Chicago wheat for September delivery is $4.41. One exporter responds with the following offer: To supply 30,000 metric tons of soft red wheat f.o.b. the Gulf of Mexico, for delivery in August, at $4.68 per bushel. Of course, other terms, such as grain quality and the payment terms are stipulated.

Calculating the per bushel price is crucial to the exporter. If the price is a cent per bushel too high, the business may be lost to a competitor, and if it is too low, the exporter may take a loss on the sale. In a competitive business like grain exporting, profit margins are not guaranteed. How did the exporter, in this example, arrive at the flat price of $4.68 at the Gulf of Mexico in August? Table A2.1 shows the calculations.

Starting at the country elevator the exporter finds the grain price today is $4.08. To this must be added truck freight cost to the river terminal elevator and the cost of elevation at the river terminal (including conditioning, shrinkage, interest, weighing and inspection, and, a profit for the owner of the river terminal elevator).

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Table A2.1 Examples of wheat price calculations on June 1 for August delivery at the Gulf

Costs and Prices	Cost	Flat price	Cash-futures basis
	----------	per bushel	----------
Country price		$4.08	-.33
Truck freight to river terminal	$.05		
Delivered price at river terminal		4.13	-.28
River terminal elevation cost	.10		
f.o.b. barge price		4.23	-.18
Barge freight	.31		
Export terminal elevation cost	.12		
Estimated profit margin	.02		
f.o.b. vessel price		4.68	+.27
September wheat futures Chicago		4.41	

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The exporter now finds the price of the wheat f.o.b. barge at the river terminal elevator to be $4.23 per bushel. After barge freight of 31 cents from the river terminal elevator to an export elevator at the Gulf of Mexico and the export terminal elevation cost of 12 cents are added, the price of wheat has climbed to $4.66. Adding an estimated profit margin of 2 cents per bushel yields the $4.68 per bushel quoted to the importer. The Table A2.1 calculations give an estimated profit margin as of June 1. There are, of course, many things which can reduce this profit margin between June and the August delivery. These are risks assumed by the exporting firm.

Risk and Risk Management

Superficially the problem facing the exporter as outlined above seems simple enough. He must find a buyer, make the sale, set the contract terms including price, assemble the grain and deliver it. In a static world this would in fact be the case, and the grain exporter would be little more than a merchant operating on a fixed mark up. However, in a dynamic world fraught with risk this is not the case. Grain prices are constantly changing in relative as well as absolute terms. Export market conditions are continually changing; weather and natural disasters disrupt transportation systems; government policy changes disrupt markets. These risks and many more place an additional burden on the grain exporting firm. However, risk is not one sided, it creates the possibility of profit as well as loss. The challenge to the grain exporter is to manage these risks in such a way that the firm earns a return investment equal to or exceeding its opportunity cost. The very essence of grain exporting is risk management.

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The following list,1/ although not comprehensive, categorizes the major risks which the grain exporter must manage:

1. quality risk, the risk of grain deterioration

2. logistical risk, the risk that transportation and handling facilities are not available

3. foreign exchange risk, exposure to adverse changes in exchange rates

4. financial risk, the risk of default on contracts

5. political risk, the risk of adverse government policy changes, domestic or foreign

6. price risk, exposure to adverse changes in flat prices

7. basis risk, exposure to adverse changes in price relationships.

These risks are not all of equal importance to the grain export firm, and obviously the extent to each risk varies with individual transactions. Selected grain export firms2/ were asked to rank these risks as very great, great, some, little or none. The perceptions of these firms yield a crude idea of the relative importance of

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1/ This list of risks incurred by exporters was derived from an interview with Robbin S. Johnson and Melvin Middents of Cargill, Inc. on January 31, 1981.

2/ Continental, Louis Dreyfus, Marubeni, C-Ito and International Grain Management Corp. See Appendix 1 for an interview guideline.

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these risks and their reasons for selecting a level of risk give some clues to risk management strategies.

The five firms all felt that there was little quality risk involved in exporting. The existence of well defined grades and standards, the opportunity to blend grains of various qualities and the specification of contract terms keep this risk at a minimum.

Some to little risk was attributed to logistics. Vertical integration in grain handling and transportation by major exporters has been viewed, at least in part, as a response to logistical risk (Caves, 1977). However, the grain exporters interviewed who owned no handling or transportation facilities, did not perceive higher levels of logistical risk than the firms that owned such facilities. This may reflect the fact that concentration in the ownership of port facilities (see Chapter 4) is not a serious problem and that if grain can be moved it will be available for purchase and loading.

Surprisingly foreign exchange was not perceived as a risk by four of the five firms. However, in the case of multinationals the bulk of their sales are priced in U.S. dollars. If the risk of shifts in exchange rates is not borne by the purchaser it is dealt with by the overseas subsidiary or affiliate of the U.S. based firm.

Perceptions of financial and political risk ranged from some to very great. These two risks were perceived to be interrelated since default on a contract is often related to political actions. These risks are difficult to manage. While the risk of predictable changes in government programs, such as the European Economic Community's

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variable levies, may provide arbitrage opportunities, less predictable changes, such as the Russian grain embargo are difficult to manage.

The management of price and basis risk are the very essence of grain trading. Although the interviewed exporters related these as being very great to some risk, they pointed out that these are manageable risks and offer opportunities for profits as well as losses. This is due to the existence of market institutions such as futures markets, which offer opportunities for hedging and forward pricing.

Astute management of all these risks is required if a firm is to be successful in the grain export business. The large size of transactions in the grain export trade (a shipload may be 25,000 metric tons or more) means that the exporter is exposed to very large risks. Since political, financial risk and to a large extent basis and logistical risk cannot be directly hedged they must be managed by risk pooling. This form of risk management leads to substantial economies of size for the exporting firm (Caves, 1977, pp. 15-17). It may also partially explain the diversification of major exporters into endeavors not directly related to grain exporting. The importance of these difficult to manage forms of risk should not overshadow the fact that price risk is the single biggest risk faced by a grain exporter.

Management of Price Risk

For example, consider the hypothetical sale of 30,000 metric tons (1,102,300 bu) of soft red wheat at $4.68 per bushel discussed above. The exporter has made a forward cash contract at a fixed price three months before

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delivery. A $.10 increase in the price of wheat would cost the exporter over $100,000 if the sale were left unhedged, reducing or wiping out his profit margin.

The exporter hedges a forward cash contract by purchasing futures contracts as a temporary substitute for the cash grain which must be purchased later for delivery. When the cash wheat is bought for delivery, futures are sold to lift the hedge. Grain merchants can use futures markets for hedging because of the close relationship between cash and futures prices. This relationship, known as the basis, may be defined as the cash price minus the futures price. Although hedging eliminates the largest part of the exporter's price risk, the risk of a change in the basis is still present. If the cash price the exporter must pay for the wheat increases relative to the futures price, the exporter's profit margin will be reduced.

Flat priced contracts are commonly used by importers who are also final users of grain. These buyers are apt to be more concerned with locking in a supply of grain at a known price and less concerned with flat price risks. These buyers may be either private or government agencies. The centrally planned economies of Eastern Europe tend to use flat priced contracts as do many government purchasing agencies of less developed countries.

Exporters making flat price sales find themselves exposed to some flat price risk from the time the initial offer is made to a buyer. If the offer is accepted and the sale made, the exporter is risking a change in the price until the sale can be covered with some combination of cash and futures purchases. When an exporter must leave an offer open overnight, the potential sale might be

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prehedged. However, if this offer is rejected, the exporter is exposed to a flat price by prehedging. So substantial risk is involved when large flat price offers remain open overnight.

Some of these risks inherent in flat price contracts may be avoided by using basis price contracts. A basis price contract does not specify the flat price but only the relationship to a designated futures price. If the contract for the grain export sale just discussed was basis priced rather than flat priced, the designated futures price would be Chicago September wheat. Assume that the agreed basis is 27 cents over Chicago September wheat futures as shown in Table A2.1. The importer may fix that flat price at any time prior to taking delivery.

This basis price sale does not initiate any flat price risk for the exporter. A basis price contract leaves the exporter open only to the risk that the basis, the difference between cash and futures prices, will shift against him. This risk is much lower than the risk of a flat price change since cash and futures prices tend to move together.

When grain is acquired for delivery in September to the importer, the exporter simultaneously sells September wheat futures. This fixes his buying basis. The selling basis was fixed at the time of the sale. The difference between the selling basis and the buying basis must cover costs including a reasonable profit.

For the importer, too, the 27-cent basis is already fixed. When the Chicago wheat futures are considered to be at a favorable level by the importer, he can lock in this flat purchase price by buying Chicago September wheat

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futures. At this point the importer is exposed to flat price risk.

Once the decision to fix the purchase price has been made by the importer, his long futures position is turned over to the exporter. This action offsets the exporter's short futures position entered into when buying the cash grain. The flat price of the sale is arrived at by adding 27 cents to the price at which the futures are exchanged. The exporter is ready to deliver on the sale: With the net cash and futures positions even.

The importer also has avoided exposure to flat price risk until entering the futures market to fix the contract price. Importing non-final users may take advantage of this by pricing their grain purchase one part at a time as it is sold to their own customers. Most of the importers using basis price contracts have been private firms. There is, however, a growing tendency on the part of foreign governments, Portugal and Poland among others, to use basis pricing.

The sound management of price risk is essential in the grain export business. As mentioned above, the existence of risk implies opportunities for profits as well as the potential for losses. The "textbook example" of pricing and hedging a grain export sale given above is deceptively simple. Grain exporters do not generally operate on the basis of individual sales, but rather on net position. They are constantly acquiring physical supplies of grains and making sales, thus the operation resembles a pipeline. The goal of managing price risk is not one of hedging individual sales but rather to maintain an overall position in cash and futures markets consistent with the exporter's

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perception of current market conditions. The following example illustrates this proposition (Howard).

Assume that prior to making the hypothetical flat priced export sale discussed above (Table A2.1) the exporter's position on June 1 was as shown in Table A2.2. Now on the morning of June 2 the exporter's bid has been accepted by the importer for 30,000 metric tons, or about 1.1 mil. bu., of soft red wheat for delivery in the last two weeks of August or the first two weeks in September. Overnight 500,000 bushels of soft red wheat were also purchased by the exporter at his facilities in the interior. His position on the morning of June 2 is shown in Table A2.3.

Prior to the transactions of June 1 the exporter was protected from the risk of a flat price change, being net long 2 mil. bu. in cash and net short 2 mil. bu. futures (Table A2.2). However, the exporter is now short .6 mil. bu., assuming he treats the 500,000 bu. of corn grain purchased overnight as a partial hedge. The exporter must now decide how to hedge the remainder of the sale. A conventional hedge would be to purchase an additional 600,000 bushels (30 5,000 bu. contracts) of Chicago September wheat. There are, however, many hedging alternatives including the purchase of cash grain for forward delivery. In addition, the exporter must consider spread relationships between the various futures contracts and the price relationships between geographical locations.

Summary

Grain exporting is not a simple operation. The coordination of grain movements alone is a formidable logistical task. Even this managerial challenge pales beside the

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Table A2.2 Exporter's net position prior to sale on June 1

Cash Market		Futures Market	
June/ July	long 5 mil. bu.	Chicago July wheat	short 5 mil. bu.
Aug./ Sept.	short 3 mil. bu.	Chicago Sept. wheat	long 3 mil. bu.
Net	long 2 mil. bu.	Net	short 2 mil. bu.

Table A2.3 Exporter's net position after sale on June 2

Cash Market		Futures Market	
June/ July	long 5.5 mil. bu.	Chicago July wheat	short 5 mil. bu.
Aug./ Sept.	short 4.1 mil. bu.	Chicago Sept. wheat	long 3 mil. bu.
Net	long 1.4 mil. bu.	Net	long 2 mil. bu.

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demands of risk management. As a result, institutions such as futures markets and forward cash markets have evolved in response to the demand for risk management tools. Exporters make effective use of these institutions.

However, the importance and usefulness of futures markets for risk management is not a measure of how well they perform their important social function of price discovery. Efficient prices, in the sense that they reflect the best available information about demand and supply, are essential for efficient resource allocation and the distribution of rewards throughout the system. A model of informational efficiency in the grain export system is developed in Chapter 6 to address this important social outcome of the private sector system.

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APPENDIX 3

DATA AND SUMMARY STATISTICS

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SOURCE: USDA, EXPORT SALES REPORTING DIV.

OBS	WKEND	TWKSL	TWCSL	TWSSL
1	06JUL75	268.4	.	.
2	13JUL75	336.0	.	.
3	20JUL75	1764.0	.	.
4	27JUL75	727.0	.	.
5	03AUG75	359.0	1343.0	176.0
6	10AUG75	926.0	1157.0	107.0
7	17AUG75	1437.0	1145.0	136.0
8	24AUG75	1331.0	822.0	408.0
9	31AUG75	993.0	466.0	641.0
10	07SEP75	361.0	556.0	96.0
11	14SEP75	436.0	663.0	172.0
12	21SEP75	606.0	268.0	248.0
13	28SEP75	579.0	449.0	164.0
14	05OCT75	631.0	315.0	315.0
15	12OCT75	412.0	201.0	640.0
16	19OCT75	599.0	694.0	182.0
17	26OCT75	804.0	1592.0	119.0
18	02NOV75	916.0	1477.0	207.0
19	09NOV75	1041.0	1723.0	408.0
20	16NOV75	841.0	551.0	189.0
21	23NOV75	467.0	522.0	99.0
22	30NOV75	359.0	394.0	112.0
23	07DEC75	537.0	333.0	276.0
24	14DEC75	636.0	650.0	178.0
25	21DEC75	750.0	867.0	490.0
26	28DEC75	593.0	532.0	91.0
27	04JAN76	736.0	403.0	22.0
28	11JAN76	357.0	597.0	174.0
29	18JAN76	464.0	594.0	271.0
30	25JAN76	1027.0	759.0	287.0
31	01FEB76	483.0	1030.0	463.0
32	08FEB76	5.0	1031.0	280.0
33	15FEB76	254.3	870.4	446.2
34	22FEB76	199.2	686.3	345.5
35	29FEB76	429.7	662.7	337.5
36	07MAR76	646.0	590.2	281.3
37	14MAR76	555.1	646.3	259.7
38	21MAR76	121.2	1502.2	531.0
39	28MAR76	340.5	420.6	116.6
40	04APR76	137.3	909.3	184.6
41	11APR76	258.2	855.5	230.3
42	18APR76	110.8	1103.4	169.8
43	25APR76	444.6	1259.4	239.3
44	02MAY76	911.7	4522.2	420.6
45	09MAY76	418.2	1453.0	606.9
46	16MAY76	608.1	1691.1	634.9
47	23MAY76	515.2	566.2	135.9
48	30MAY76	315.6	996.6	216.2
49	06JUN76	437.6	653.7	69.5
50	13JUN76	165.2	1236.6	184.5
51	20JUN76	444.7	1051.9	271.7
52	27JUN76	346.6	533.3	122.3

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SOURCE: USDA, EXPORT SALES REPORTING DIV.

OBS	WKEND	TNWSL	TNCSL	TNSSL
53	04JUL76	334.7	1126.6	1092.2
54	11JUL76	1896.5	1090.9	729.3
55	18JUL76	1329.6	1093.5	123.0
56	25JUL76	721.5	917.6	196.4
57	01AUG76	405.9	1138.0	132.6
58	08AUG76	727.2	1100.7	206.6
59	15AUG76	742.3	918.3	186.6
60	22AUG76	578.2	966.7	209.4
61	29AUG76	782.0	866.9	227.0
62	05SEP76	950.3	1145.2	259.2
63	12SEP76	137.3	454.4	423.1
64	19SEP76	453.3	663.6	530.5
65	26SEP76	659.0	856.3	436.4
66	03OCT76	650.5	627.7	453.4
67	10OCT76	521.9	1534.5	492.5
68	17OCT76	990.6	674.0	470.4
69	24OCT76	199.0	749.0	352.6
70	31OCT76	284.3	571.1	435.2
71	07NOV76	444.7	365.4	205.6
72	14NOV76	301.6	746.0	365.6
73	21NOV76	421.5	1463.5	560.9
74	28NOV76	176.1	517.1	234.9
75	05DEC76	483.6	136.6	467.0
76	12DEC76	261.2	699.0	417.6
77	19DEC76	101.1	558.7	391.4
78	26DEC76	136.8	475.4	138.8
79	02JAN77	309.2	359.1	245.5
80	09JAN77	52.5	664.0	316.7
81	16JAN77	610.5	1052.3	217.1
82	23JAN77	264.5	693.0	305.3
83	30JAN77	212.7	786.0	610.8
84	06FEB77	144.1	441.9	550.6
85	13FEB77	141.1	299.7	322.2
86	20FEB77	110.6	675.0	303.4
87	27FEB77	455.0	1344.7	310.7
88	06MAR77	363.2	679.5	255.3
89	13MAR77	186.3	776.0	473.0
90	20MAR77	251.4	731.6	539.7
91	27MAR77	654.2	955.5	592.5
92	03APR77	392.3	445.7	1002.6
93	10APR77	342.8	428.2	1039.9
94	17APR77	425.3	690.8	-107.1
95	24APR77	761.4	740.1	493.7
96	01MAY77	341.9	478.8	323.7
97	08MAY77	295.1	609.7	265.8
98	15MAY77	556.7	458.0	259.1
99	22MAY77	234.2	422.2	94.9
100	29MAY77	173.7	739.4	-8.1
101	05JUN77	360.9	963.8	-17.6
102	12JUN77	963.0	649.3	157.4
103	19JUN77	679.9	449.2	65.9
104	26JUN77	363.3	594.8	173.2

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SOURCE: USDA, EXPORT SALES REPORTING DIV.

OBS	WKEND	TNWSL	TNCSL	TNSSL
105	03JUL77	698.5	1036.1	61.4
106	10JUL77	648.9	914.9	256.5
107	17JUL77	570.6	836.5	255.5
108	24JUL77	435.0	836.1	31.6
109	31JUL77	660.9	1155.1	-15.3
110	07AUG77	346.0	755.5	369.0
111	14AUG77	1321.2	4253.5	3071.6
112	21AUG77	547.2	985.9	270.0
113	28AUG77	692.5	1042.4	100.9
114	04SEP77	530.1	814.6	281.5
115	11SEP77	642.3	814.7	403.1
116	18SEP77	946.2	1114.4	385.3
117	25SEP77	622.8	1076.5	247.0
118	02OCT77	332.1	646.9	459.8
119	09OCT77	694.4	723.5	270.1
120	17OCT77	420.6	586.5	279.1
121	23OCT77	459.3	526.5	524.5
122	30OCT77	806.4	835.3	367.5
123	06NOV77	362.7	549.5	145.1
124	13NOV77	532.2	930.8	241.3
125	20NOV77	1410.0	1525.3	55.5
126	27NOV77	261.3	3.3	126.8
127	04DEC77	709.9	2441.3	906.9
128	11DEC77	747.9	1217.3	907.0
129	18DEC77	827.9	978.0	272.1
130	25DEC77	456.3	558.0	203.5
131	02JAN78	359.7	626.9	318.2
132	08JAN78	485.7	516.7	264.3
133	15JAN78	353.6	993.5	356.6
134	22JAN78	591.0	1081.7	526.2
135	29JAN78	603.5	2209.4	695.5
136	05FEB78	1112.8	1515.8	915.3
137	12FEB78	720.9	987.1	497.9
138	19FEB78	907.8	870.1	457.7
139	26FEB78	100.7	1235.6	547.4
140	05MAR78	509.7	731.8	800.5
141	12MAR78	703.3	985.4	641.3
142	19MAR78	297.2	1142.1	365.5
143	26MAR78	300.2	1036.3	357.5
144	02APR78	401.9	1309.7	875.5
145	09APR78	812.8	1310.4	673.4
146	16APR78	667.8	935.9	535.7
147	23APR78	644.1	709.9	922.1
148	30APR78	905.9	1384.3	495.3
149	07MAY78	214.1	1055.6	98.7
150	14MAY78	215.9	833.4	217.0
151	21MAY78	444.3	862.2	453.1
152	28MAY78	574.6	978.6	418.0
153	04JUN78	93.6	758.6	133.2
154	11JUN78	634.2	813.4	378.7
155	18JUN78	435.0	1069.8	201.8
156	25JUN78	533.2	992.7	141.9

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OBS	WKEND	TNWSL	TNCSL	TNSSL
157	12JUL78	506.7	632.2	-2.9
158	19JUL78	954.6	1233.3	533.9
159	26JUL78	361.0	1352.1	278.1
160	2AUG78	607.2	870.7	662.0
161	9AUG78	773.8	1116.1	242.4
162	16AUG78	295.1	917.9	309.5
163	23AUG78	1074.5	798.2	633.5
164	30AUG78	561.5	721.8	815.6
165	6SEP78	1011.8	755.9	455.5
166	13SEP78	752.7	450.6	361.5
167	20SEP78	590.0	659.7	224.1
168	27SEP78	801.9	444.1	417.5
169	4OCT78	634.0	1054.0	204.8
170	11OCT78	496.8	446.9	316.4
171	18OCT78	404.2	615.6	592.0
172	25OCT78	606.9	921.5	681.8
173	1NOV78	669.0	616.2	701.6
174	8NOV78	785.3	1056.3	1090.5
175	15NOV78	1363.2	1686.8	350.6
176	22NOV78	872.9	1525.3	425.5
177	29NOV78	476.2	1398.7	229.9
178	6DEC78	481.5	822.8	332.7
179	13DEC78	653.2	2118.4	304.6
180	20DEC78	652.3	1057.9	269.7
181	27DEC78	394.7	634.4	300.9
182	3JAN79	576.2	457.0	1153.6
183	10JAN79	119.8	685.7	214.3
184	17JAN79	135.7	51.4	211.1
185	24JAN79	577.8	664.1	949.6
186	31JAN79	595.5	874.3	217.5
187	7FEB79	356.5	1083.2	195.4
188	14FEB79	671.0	794.5	302.0
189	21FEB79	489.6	1000.3	501.8
190	28FEB79	776.0	1561.1	303.0
191	7MAR79	445.4	854.5	729.7
192	14MAR79	369.2	1437.0	406.2
193	21MAR79	846.6	614.7	229.9
194	28MAR79	972.2	778.5	233.4
195	4APR79	312.8	498.9	61.0
196	11APR79	79.6	969.1	191.6
197	18APR79	309.1	916.4	250.2
198	25APR79	363.5	676.9	402.8
199	2MAY79	296.4	1675.6	256.3
200	9MAY79	555.3	2169.7	439.9
201	16MAY79	422.9	2406.8	254.6
202	23MAY79	509.8	3525.7	271.2
203	30MAY79	846.5	1196.3	316.2
204	6JUN79	363.2	599.6	63.4
205	13JUN79	577.2	1561.7	443.0
206	20JUN79	506.6	1656.2	503.0
207	27JUN79	1245.6	2019.2	852.8
208	4JUL79	1169.8	2976.7	939.7

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SOURCE: USDA, EXPORT SALES REPORTING DIV.

OBS	TREND	TWHSL	TWCSL	TWSSL
209	01JUL79	2482.6	5074.0	337.9
210	08JUL79	1432.8	5539.5	311.3
211	15JUL79	2036.8	5342.2	569.7
212	22JUL79	765.8	1958.5	265.7
213	29JUL79	1150.3	1771.2	529.4
214	05AUG79	767.3	715.9	744.9
215	12AUG79	524.3	1393.5	322.6
216	19AUG79	342.5	651.0	193.9
217	26AUG79	476.1	74.6	595.9
218	02SEP79	628.3	672.4	596.2
219	09SEP79	411.1	524.6	457.3
220	16SEP79	860.5	666.9	410.8
221	23SEP79	291.3	1258.9	371.4
222	30SEP79	292.6	2867.2	283.9
223	07OCT79	620.0	1184.1	207.5
224	14OCT79	925.1	1640.4	796.4
225	21OCT79	607.8	1498.4	585.5
226	28OCT79	1016.4	1522.5	492.4
227	04NOV79	450.9	1016.9	486.8
228	11NOV79	476.0	823.2	479.8
229	18NOV79	1541.9	2545.3	311.9
230	25NOV79	449.9	947.4	579.2
231	02DEC79	573.2	1136.2	442.2
232	09DEC79	692.9	1152.2	416.5
233	16DEC79	514.9	1323.3	329.3
234	23DEC79	741.7	933.5	355.0
235	30DEC79	437.8	497.5	93.4
236	06JAN80	721.8	971.2	431.2
237	13JAN80	1306.6	1579.5	1017.0
238	20JAN80	1307.5	1436.4	764.7
239	27JAN80	845.2	1169.7	575.5
240	03FEB80	634.1	1084.7	367.6
241	10FEB80	532.8	761.9	406.6
242	17FEB80	540.6	1811.0	340.3
243	24FEB80	391.0	819.1	439.7
244	02MAR80	1105.2	584.5	261.1
245	09MAR80	432.4	1173.7	370.2
246	16MAR80	-3818.0	-8221.7	-[illegible]3.3
247	23MAR80	637.0	45.7	514.5
248	30MAR80	1260.7	597.0	521.8
249	06APR80	116.4	627.1	152.8
250	13APR80	348.0	819.5	661.0
251	20APR80	594.6	970.9	614.2
252	27APR80	167.6	892.3	557.5
253	04MAY80	359.9	123.8	442.7
254	11MAY80	415.5	485.1	327.2
255	18MAY80	536.8	2031.1	373.8
256	25MAY80	225.5	1160.6	398.3
257	01JUN80	1120.1	1076.9	651.6
258	08JUN80	740.4	1514.0	465.9
259	15JUN80	865.8	1154.4	333.8

BEST DOCUMENT AVAILABLE

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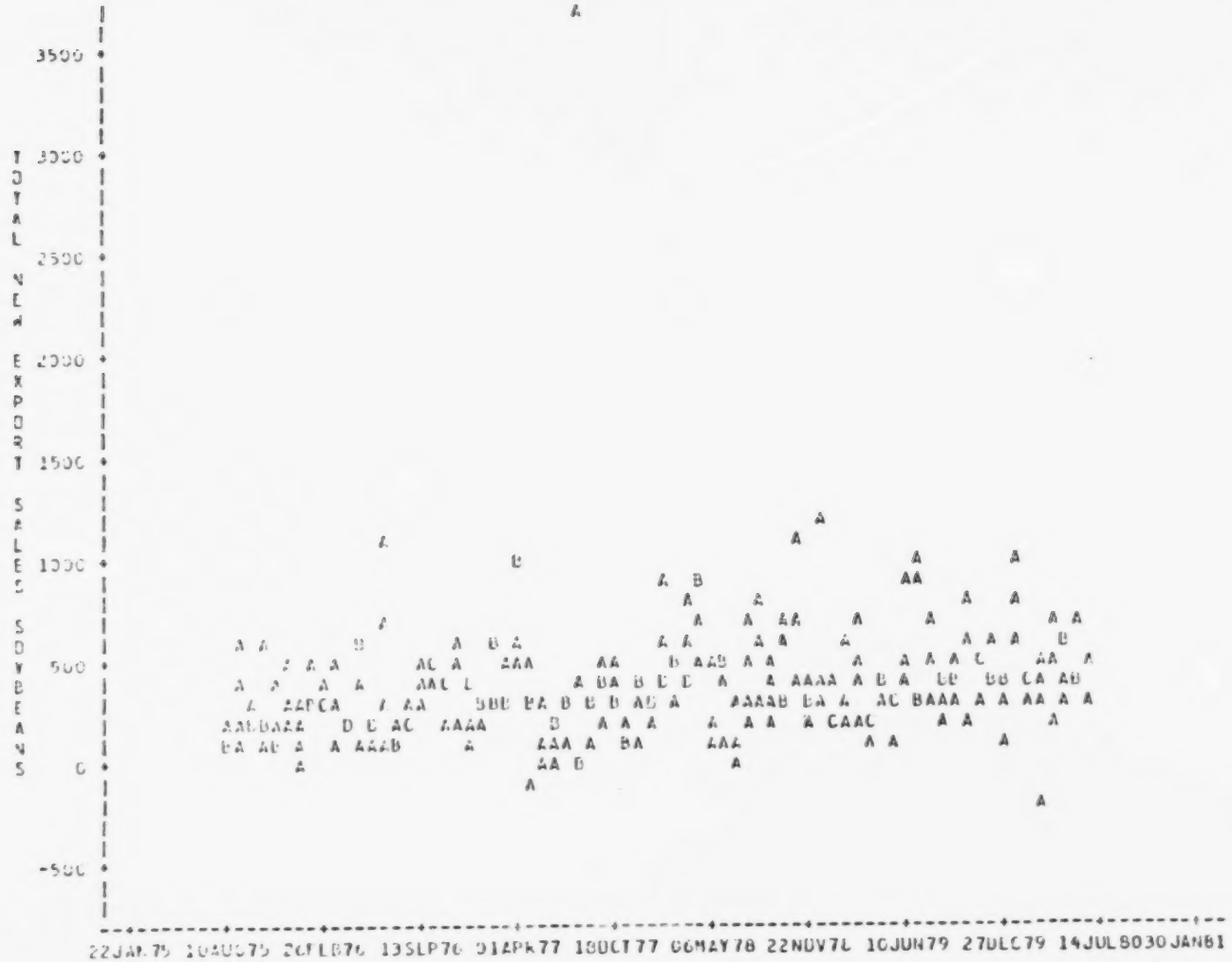
SOURCE: USDA, EXPORT SALES REPORTING DIV.

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
TNWSL	TOTAL NEW EXPORT SALES WHEAT	259	579.6177606	462.9131698	-3616.000000	2836.80000
TNCSL	TOTAL NEW EXPORT SALES CORN	255	972.3105882	870.6964356	-6221.700000	4522.20000
TNSSL	TOTAL NEW EXPORT SALES SOYBEANS	255	361.6345098	304.9778306	-233.300000	3671.60000



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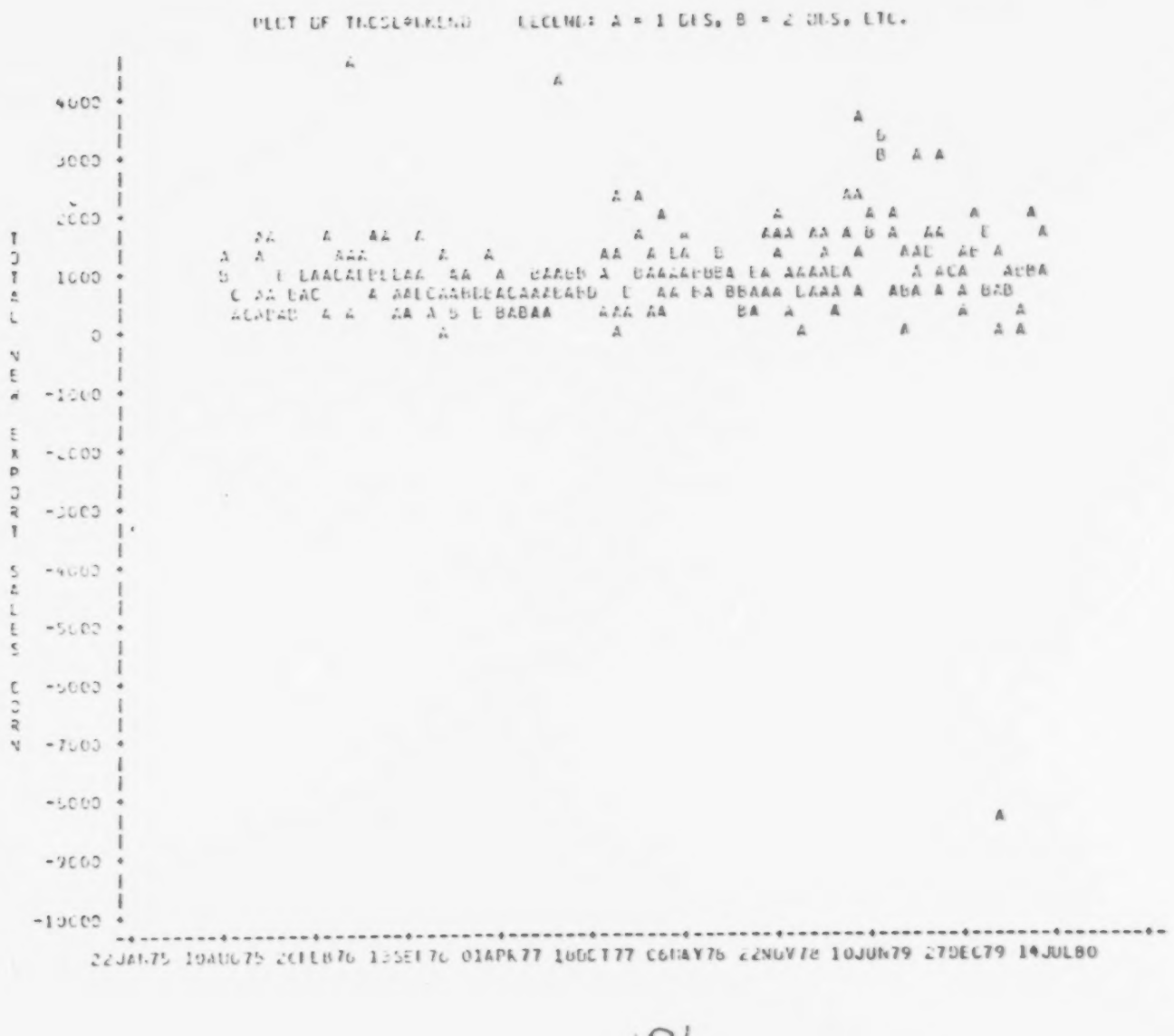


BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC 14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	WKEND	WPRDIF	CPRDIF	SPRDIF
1	06JUL75	.	.	.
2	13JUL75	52.00	12.50	46.00
3	20JUL75	0.00	4.25	1.00
4	27JUL75	30.00	15.00	66.00
5	03AUG75	-20.00	5.75	-24.00
6	10AUG75	13.00	7.50	-2.00
7	17AUG75	30.50	7.50	10.25
8	24AUG75	26.50	5.75	6.75
9	31AUG75	-26.00	-24.75	-54.00
10	07SEP75	8.50	1.75	-6.00
11	14SEP75	4.50	4.25	17.00
12	21SEP75	5.00	4.50	3.00
13	28SEP75	-4.50	-2.25	-11.00
14	05OCT75	-9.00	-5.50	-21.00
15	12OCT75	-13.00	-5.50	-9.00
16	19OCT75	6.50	6.75	-9.00
17	26OCT75	-32.00	-18.00	-45.00
18	02NOV75	-5.50	-1.00	11.00
19	09NOV75	-10.00	-4.50	6.50
20	16NOV75	-13.50	-8.75	-16.50
21	23NOV75	6.00	9.50	13.75
22	30NOV75	-2.00	4.50	-6.75
23	07DEC75	-11.00	-11.75	-21.50
24	14DEC75	-12.00	-6.25	-18.00
25	21DEC75	9.00	7.25	12.50
26	28DEC75	-10.75	-6.75	-11.50
27	04JAN76	20.25	5.00	22.00
28	11JAN76	11.00	4.25	18.50
29	18JAN76	-2.50	3.50	6.00
30	25JAN76	-24.00	-11.75	-36.25
31	01FEB76	22.00	7.00	19.75
32	08FEB76	-4.00	-2.75	-6.50
33	15FEB76	39.00	5.00	6.50
34	22FEB76	-11.50	-1.00	-1.50
35	29FEB76	13.00	7.00	7.00
36	07MAR76	-14.00	-2.25	1.00
37	14MAR76	-8.50	-5.25	-14.00
38	21MAR76	5.50	5.00	6.00
39	28MAR76	-30.00	-6.75	-12.50
40	04APR76	2.50	1.50	3.50
41	11APR76	-0.50	-1.00	10.00
42	18APR76	3.25	0.75	-0.00
43	25APR76	-16.75	0.75	-10.00
44	02MAY76	5.50	7.75	12.25
45	09MAY76	2.25	5.00	21.50
46	16MAY76	12.25	4.50	22.50
47	23MAY76	4.50	7.50	34.00
48	30MAY76	7.50	0.00	21.50
49	06JUN76	2.00	14.00	14.50
50	13JUN76	0.00	-5.50	7.50
51	20JUN76	0.00	-1.00	-42.50

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CLOSE/BID) CHICAGO BOARD OF TRADE
SOURCE: CFTC 14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	WKEND	WPRDIF	CPRDIF	SPRDIF
52	27JUN76	1.00	0.00	32.50
53	04JUL76	29.00	5.50	63.00
54	11JUL76	-36.00	-9.00	-6.50
55	18JUL76	-6.50	-5.00	-45.50
56	25JUL76	-8.50	-11.25	-56.00
57	01AUG76	-20.00	-4.75	-33.50
58	08AUG76	-5.50	1.25	37.50
59	15AUG76	2.00	2.50	10.50
60	22AUG76	1.00	5.25	37.00
61	29AUG76	-20.50	-5.75	-11.50
62	05SEP76	36.50	22.00	70.50
63	12SEP76	-22.50	-9.00	-22.50
64	19SEP76	-9.50	-6.00	-62.00
65	26SEP76	-7.75	-13.25	-10.00
66	03OCT76	-13.25	-0.50	4.00
67	10OCT76	2.50	-3.25	-4.00
68	17OCT76	-2.50	-2.50	-30.00
69	24OCT76	-8.25	-5.75	47.00
70	31OCT76	-4.00	-10.50	27.00
71	07NOV76	-7.00	-4.25	-7.00
72	14NOV76	-7.75	-16.25	-41.00
73	21NOV76	2.00	11.00	59.00
74	28NOV76	-12.25	-4.00	-20.00
75	05DEC76	22.25	14.75	24.50
76	12DEC76	0.00	-1.50	-4.50
77	19DEC76	-7.00	-3.25	-0.50
78	26DEC76	11.25	0.00	18.00
79	02JAN77	-3.50	0.25	4.00
80	09JAN77	7.25	9.50	10.50
81	16JAN77	-3.50	-2.25	-4.50
82	23JAN77	2.50	-1.75	10.00
83	30JAN77	-6.75	-7.25	-11.00
84	06FEB77	3.75	2.75	5.00
85	13FEB77	-1.50	-2.25	0.75
86	20FEB77	5.25	2.50	14.75
87	27FEB77	-10.75	-1.75	33.50
88	07MAR77	10.00	6.25	62.00
89	13MAR77	-4.00	-2.75	-14.50
90	20MAR77	4.00	2.25	50.50
91	27MAR77	-6.00	-4.25	-2.00
92	03APR77	-0.50	10.25	48.00
93	10APR77	0.25	6.00	72.00
94	17APR77	0.75	3.50	31.50
95	24APR77	-13.25	-15.00	7.50
96	01MAY77	5.50	-10.50	-3.00
97	08MAY77	-8.50	-5.50	-66.00
98	15MAY77	-0.75	-4.75	19.00
99	22MAY77	-3.00	2.75	-59.00
100	29MAY77	-3.50	6.75	42.00
101	05JUN77	-5.00	-5.75	-45.00
102	12JUN77	-7.75	-16.50	-52.00

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC 14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	TREND	WPRDIF	CPRDIF	SPRDIF
103	29JUN77	9.25	-1.00	-96.00
104	06JUL77	6.00	-3.75	5.00
105	13JUL77	-6.50	1.25	-75.50
106	10JUL77	-6.75	-15.00	-97.50
107	17JUL77	-3.50	-5.50	11.00
108	24JUL77	-0.25	-2.25	10.00
109	31JUL77	-3.50	-15.50	-82.00
110	07AUG77	-2.50	1.00	10.00
111	14AUG77	-7.50	-7.50	-44.00
112	21AUG77	-2.50	-7.00	-1.00
113	28AUG77	2.00	0.75	2.00
114	04SEP77	19.50	15.50	10.00
115	11SEP77	8.50	5.75	-23.00
116	18SEP77	0.50	-2.25	15.00
117	25SEP77	7.50	2.75	14.50
118	02OCT77	3.75	1.75	-2.50
119	09OCT77	-6.25	5.00	11.00
120	17OCT77	-1.50	-3.75	-30.00
121	23OCT77	2.00	2.25	15.00
122	30OCT77	7.25	5.00	19.00
123	06NOV77	10.25	6.25	50.00
124	13NOV77	3.50	-0.25	-1.00
125	20NOV77	0.50	4.25	12.50
126	27NOV77	-5.50	-1.75	-20.50
127	04DEC77	-0.50	2.75	-6.00
128	11DEC77	-3.50	-4.00	2.00
129	18DEC77	1.75	2.00	11.00
130	25DEC77	15.00	1.75	0.50
131	02JAN78	-5.50	-2.25	-6.50
132	08JAN78	5.00	0.25	1.50
133	15JAN78	-7.75	-0.50	-16.00
134	22JAN78	3.25	3.75	-14.50
135	29JAN78	-4.50	0.75	-3.00
136	05FEB78	-2.25	0.00	21.00
137	12FEB78	-1.25	-0.50	-9.00
138	19FEB78	-2.75	0.25	10.00
139	26FEB78	-10.25	-1.75	0.00
140	05MAR78	18.25	8.50	20.50
141	12MAR78	11.50	0.00	50.00
142	19MAR78	12.00	9.25	30.00
143	26MAR78	7.00	7.00	30.50
144	02APR78	9.00	-1.00	-87.50
145	09APR78	19.50	10.75	40.50
146	16APR78	-5.50	-5.25	12.00
147	23APR78	-29.00	-15.25	65.25
148	30APR78	7.00	0.25	-74.25
149	07MAY78	-3.50	5.25	-14.00
150	14MAY78	21.00	5.75	25.00
151	21MAY78	2.00	0.00	-12.50
152	28MAY78	16.00	12.75	36.50
153	04JUN78	-10.50	7.75	-37.50

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CITC 14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	WKEND	WKDIF	CRDIF	SPRDIF
154	11JUN78	-18.75	-6.00	-12.5
155	18JUN78	14.25	-3.00	-12.0
156	25JUN78	-3.50	3.00	11.0
157	02JUL78	-0.25	-14.25	-36.0
158	09JUL78	4.75	-0.75	23.0
159	16JUL78	-14.00	-12.25	-43.0
160	23JUL78	-2.50	-5.50	-6.0
161	30JUL78	0.75	-1.00	10.0
162	06AUG78	-10.75	-13.75	-37.5
163	13AUG78	20.00	6.25	31.5
164	20AUG78	-1.00	0.25	15.0
165	27AUG78	7.75	-4.00	2.0
166	03SEP78	-2.00	1.75	-21.0
167	11SEP78	3.00	3.50	20.0
168	17SEP78	-5.25	-6.00	7.0
169	24SEP78	15.25	2.25	-16.0
170	01OCT78	5.75	5.50	20.0
171	08OCT78	-2.00	0.00	17.0
172	15OCT78	6.50	3.00	17.0
173	22OCT78	-16.00	-4.50	-22.0
174	29OCT78	28.50	7.00	46.0
175	05NOV78	0.00	-4.25	-21.0
176	12NOV78	4.00	-1.25	-19.0
177	19NOV78	-10.50	-4.00	-15.5
178	26NOV78	13.50	1.25	7.0
179	03DEC78	-9.25	5.75	-9.5
180	10DEC78	-13.25	-2.00	11.0
181	17DEC78	-0.50	-1.00	26.0
182	24DEC78	-9.25	-2.00	-20.0
183	31DEC78	2.75	0.00	6.5
184	07JAN79	-4.25	-2.00	6.5
185	15JAN79	17.75	4.00	15.0
186	22JAN79	-3.75	-0.75	-0.5
187	29JAN79	-1.75	0.75	-14.5
188	04FEB79	9.25	1.50	29.0
189	11FEB79	0.25	1.00	17.0
190	18FEB79	-6.00	1.75	31.0
191	25FEB79	7.50	-1.25	-26.0
192	04MAR79	-10.50	10.25	21.5
193	11MAR79	-9.00	-2.50	-16.5
194	18MAR79	-5.25	0.25	12.0
195	25MAR79	5.25	4.75	21.0
196	01APR79	-12.00	2.25	-19.5
197	08APR79	0.00	2.25	-2.5
198	15APR79	2.00	-1.00	-34.5
199	22APR79	3.50	0.50	2.5
200	29APR79	14.00	5.50	-10.0
201	06MAY79	2.25	6.50	19.0
202	13MAY79	20.00	1.00	-9.5
203	20MAY79	-16.00	1.25	12.0
204	27MAY79	0.75	0.75	0.0

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC 14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	WKEND	WPRDIF	CPRDIF	SPRDIF
205	06JUN79	11.00	0.75	-2.0
206	13JUN79	48.00	6.75	28.5
207	17JUN79	14.00	9.00	23.0
208	24JUN79	34.00	25.00	48.0
209	01JUL79	-19.50	-7.50	-61.5
210	08JUL79	20.50	9.75	41.5
211	15JUL79	-22.50	-5.25	-33.0
212	22JUL79	-5.50	-2.75	-5.0
213	29JUL79	-26.00	-30.00	-56.5
214	05AUG79	-9.00	0.25	-9.5
215	12AUG79	6.00	-4.50	-1.0
216	19AUG79	24.50	7.00	18.0
217	26AUG79	3.50	3.00	2.0
218	02SEP79	-3.75	-6.25	-23.0
219	09SEP79	5.75	0.25	11.5
220	16SEP79	11.00	1.50	15.5
221	23SEP79	-1.00	2.75	-3.0
222	30SEP79	14.00	5.50	2.0
223	07OCT79	-11.00	-5.25	-21.0
224	14OCT79	-22.00	-5.25	-43.0
225	21OCT79	20.50	4.00	-3.0
226	28OCT79	-35.00	-18.75	-17.0
227	04NOV79	-2.50	1.75	29.0
228	11NOV79	15.00	2.25	20.0
229	18NOV79	2.00	5.00	-3.0
230	25NOV79	-7.50	2.25	-14.5
231	02DEC79	26.50	15.25	9.5
232	09DEC79	-6.50	-4.25	-16.5
233	16DEC79	-0.50	-0.75	-2.0
234	23DEC79	19.50	9.75	4.5
235	30DEC79	-10.00	-4.50	-22.5
236	06JAN80	-29.00	-15.00	-6.0
237	13JAN80	1.00	-4.00	23.0
238	20JAN80	19.50	1.25	3.5
239	27JAN80	10.00	1.00	-1.0
240	03FEB80	20.50	6.00	19.5
241	10FEB80	-14.00	-5.25	-6.0
242	17FEB80	-23.00	-5.75	-36.5
243	24FEB80	8.50	-1.00	4.0
244	02MAR80	-2.00	5.50	19.0
245	09MAR80	-6.50	-2.50	-17.0
246	16MAR80	-12.25	0.00	-11.5
247	23MAR80	-0.25	-6.00	-15.5
248	30MAR80	-44.00	-7.00	-34.5
249	06APR80	19.50	9.50	3.5
250	13APR80	-10.50	-1.50	4.0
251	20APR80	6.50	2.00	8.0
252	27APR80	-13.50	-2.25	0.0
253	04MAY80	36.75	16.75	32.0
254	11MAY80	-10.75	-5.00	-15.0
255	18MAY80	12.00	2.25	6.5

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CITC 14:44 TUESDAY, SEPTEMBER 22, 1981

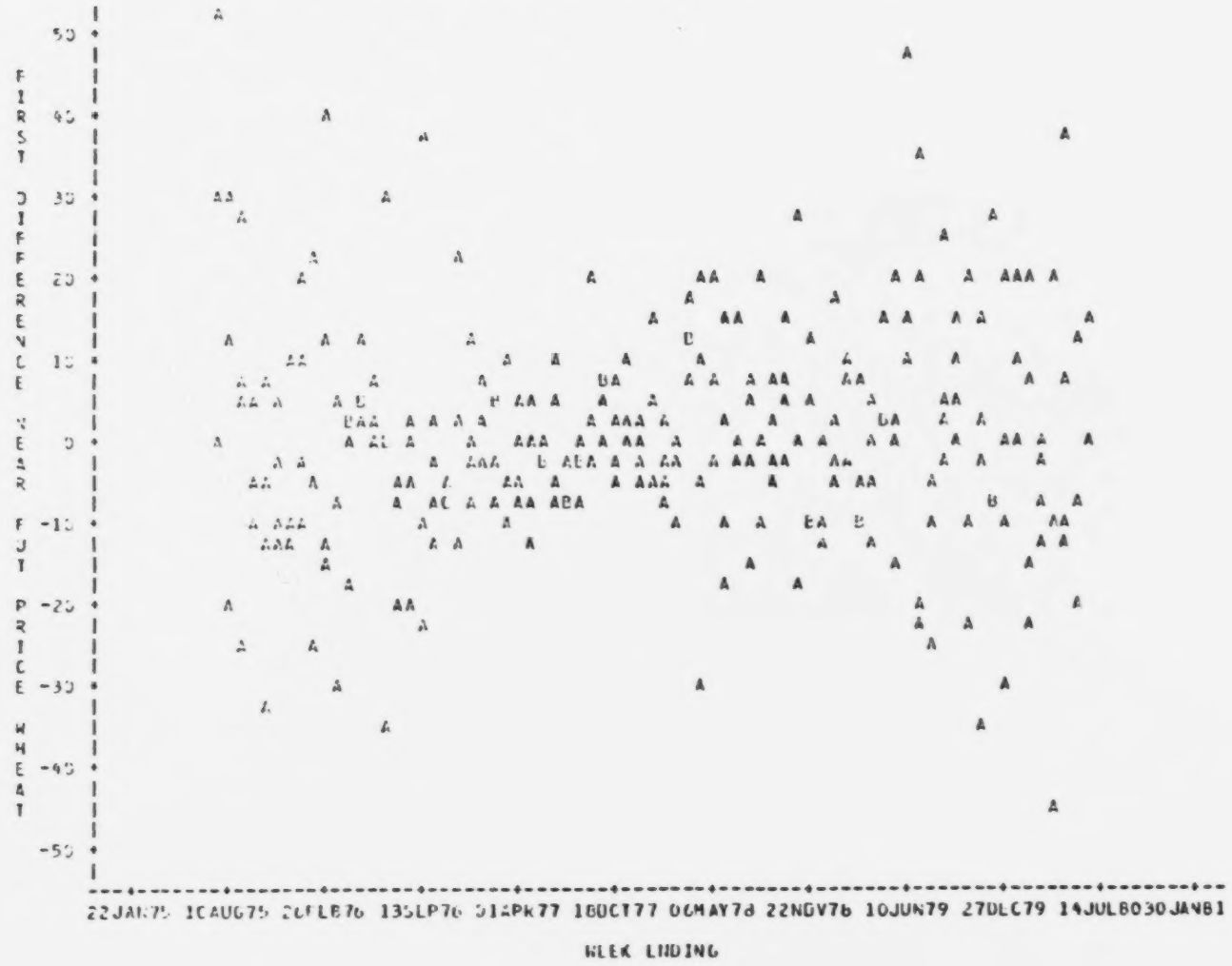
DDS	WKEND	WPRDIF	CPRDIF	SPRDIF
256	09AY80	-7.0	2.25	14.5
257	16JUN80	-20.0	-7.50	-20.5
258	23JUN80	-0.5	-0.25	7.0
259	30JUN80	15.5	7.25	12.5

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

WEEKLY CHANGE IN THE NEAR FUTURES
PRICE OF WHEAT, CORN, AND SOYBEANS
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC 14:44 TUESDAY, SEPTEMBER 22, 1981

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WPRDIF	258	0.40697674	13.8434922	-44.0000000	52.0000000	0.86223172	105.000000	191.806434
CPRDIF	258	0.09496124	7.4051521	-30.0000000	25.0000000	0.46102463	24.500000	54.836278
SPRDIF	258	0.48062016	28.9672699	-97.5000000	75.5000000	1.80466984	124.000000	840.262974



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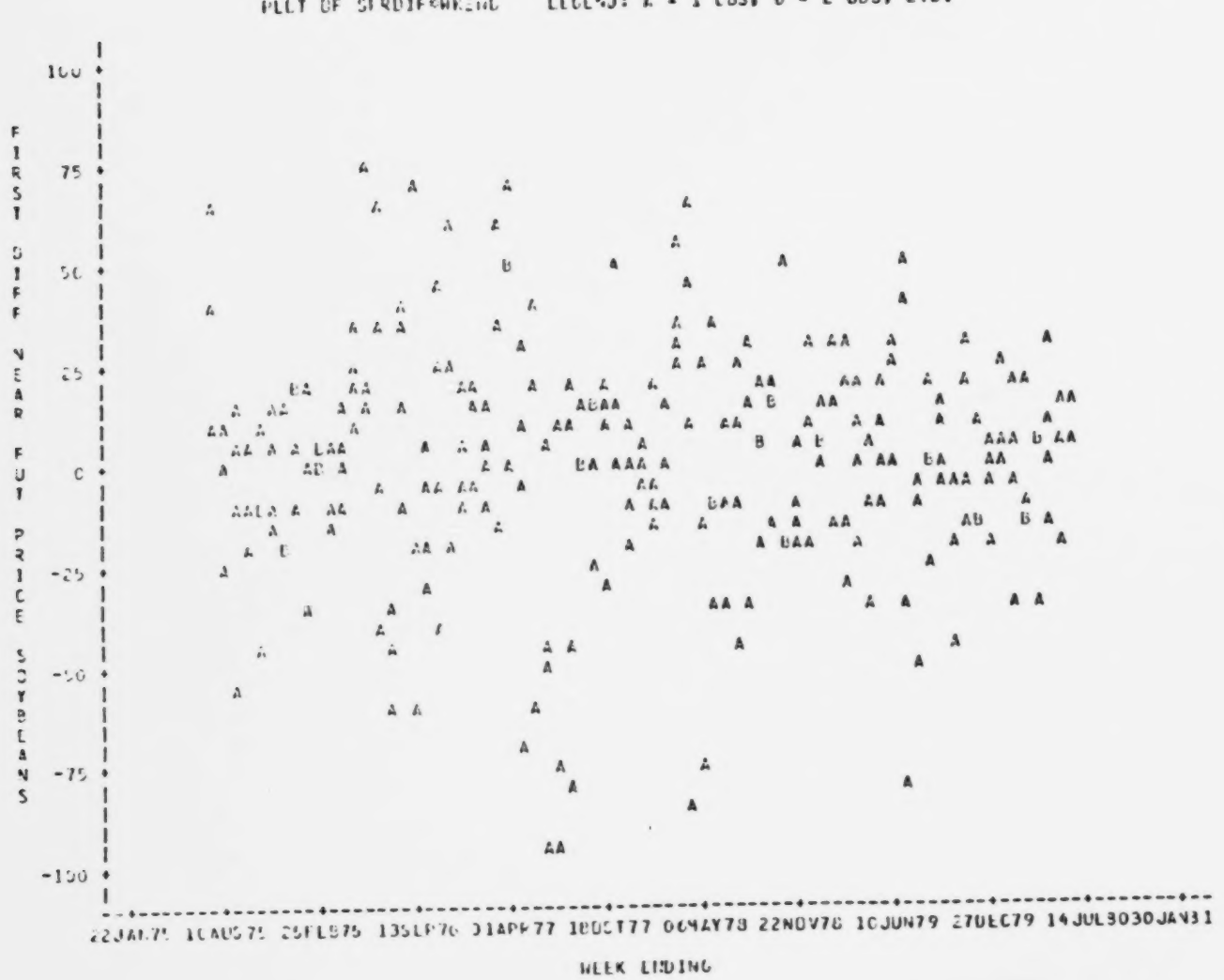

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DAILY CHANGE IN THE NEAR FUTURES PRICE 31
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES REPT
1975 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

OBS	DATE	WHEAT	CORN	SOY
1	06JUL75	2.500	-1.125	-7.000
2	13JUL75	17.000	6.750	20.000
3	20JUL75	-11.500	-9.250	-15.000
4	27JUL75	7.250	5.500	20.000
5	03AUG75	2.750	3.250	7.500
6	10AUG75	-6.750	-4.750	-10.250
7	17AUG75	5.250	4.500	20.000
8	24AUG75	0.000	-1.625	3.500
9	31AUG75	-1.000	-5.750	-6.750
10	07SEP75	0.250	4.500	2.000
11	14SEP75	16.000	10.125	20.000
12	21SEP75	-6.750	-5.000	-3.000
13	28SEP75	-1.000	1.000	-4.000
14	05OCT75	2.750	2.000	-7.250
15	12OCT75	3.520	0.250	-2.250
16	19OCT75	-4.000	-3.625	-10.000
17	26OCT75	-0.750	-1.625	-2.250
18	02NOV75	-3.500	-3.625	-5.000
19	09NOV75	-25.000	-1.875	-6.750
20	16NOV75	4.250	6.375	1.000
21	23NOV75	5.000	4.125	7.250
22	30NOV75	-5.250	-2.125	-2.250
23	07DEC75	-4.500	-2.375	-6.000
24	14DEC75	-13.000	-6.000	-17.250
25	21DEC75	3.750	3.625	6.750
26	28DEC75	-7.125	-3.000	-9.750
27	04JAN76	2.250	6.250	-1.000
28	11JAN76	-2.250	-1.875	-1.000
29	18JAN76	-0.500	1.250	4.500
30	25JAN76	1.250	2.875	1.250
31	01FEB76	6.500	1.000	1.500
32	08FEB76	2.125	0.500	0.750
33	15FEB76	-5.000	-1.875	-1.750
34	22FEB76	-6.750	-1.250	-4.750
35	29FEB76	20.000	2.500	1.250
36	07MAR76	-1.750	0.500	-1.000
37	14MAR76	2.000	-2.250	-4.000
38	21MAR76	-1.250	-1.000	2.750
39	28MAR76	-4.500	-6.750	-2.250
40	04APR76	-0.375	0.750	-1.750
41	11APR76	-0.625	-6.500	-0.875
42	18APR76	10.500	3.000	4.625
43	25APR76	-10.250	6.000	-8.250
44	02MAY76	0.875	0.875	-1.250
45	09MAY76	-1.250	1.875	9.875
46	16MAY76	-1.500	2.000	5.000
47	23MAY76	-0.375	3.250	4.000
48	30MAY76	-1.250	-2.875	3.000
49	06JUN76	-4.375	1.750	4.250

BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE NEAR FUTURES PRICE
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES REPT
1975 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

OBS	WKEND	WHEAT	PCORN	SOY
50	12JUN76	-10.500	-5.250	10.25
51	26JUN76	0.500	-0.125	-7.00
52	27JUN76	-3.000	2.500	13.25
53	04JUL76	1.250	2.500	20.00
54	11JUL76	-7.000	0.500	12.50
55	18JUL76	-1.250	-0.750	-14.00
56	25JUL76	4.750	3.000	10.00
57	01AUG76	-4.000	-1.500	-10.75
58	08AUG76	-5.125	-1.875	4.50
59	15AUG76	1.000	0.750	10.00
60	22AUG76	-2.125	-1.250	11.50
61	29AUG76	-2.875	2.375	5.00
62	05SEP76	-2.000	1.000	9.50
63	12SEP76	-3.000	-0.750	-6.00
64	19SEP76	-8.750	-5.750	-20.00
65	26SEP76	-5.500	-4.500	-15.50
66	03OCT76	-4.250	-2.250	-12.00
67	10OCT76	-2.250	-4.500	-3.50
68	17OCT76	-5.750	-2.250	-11.00
69	24OCT76	-2.250	-0.500	24.50
70	31OCT76	3.500	0.500	19.50
71	07NOV76	-2.500	-0.500	2.00
72	14NOV76	1.500	-2.500	2.00
73	21NOV76	0.500	2.000	12.25
74	28NOV76	-4.000	-1.750	-6.25
75	05DEC76	3.000	2.750	6.25
76	12DEC76	0.000	-1.000	-6.50
77	19DEC76	-3.500	-2.000	-13.00
78	26DEC76	6.500	0.750	6.00
79	02JAN77	-3.000	-1.500	-7.00
80	09JAN77	-2.500	-1.000	-6.50
81	16JAN77	-2.250	-1.000	-5.25
82	23JAN77	-6.500	0.500	-4.00
83	30JAN77	-0.250	-1.500	-1.00
84	06FEB77	3.750	2.500	1.50
85	13FEB77	-3.500	-1.750	-2.50
86	20FEB77	3.250	0.500	3.50
87	27FEB77	-4.000	-2.000	-5.00
88	07MAR77	3.000	0.250	-7.00
89	13MAR77	0.000	-0.500	-5.00
90	20MAR77	0.500	0.500	5.25
91	27MAR77	1.250	0.500	19.00
92	03APR77	0.500	1.750	26.00
93	10APR77	1.500	2.500	5.00
94	17APR77	2.500	-1.250	25.00
95	24APR77	-3.250	-2.750	-2.00
96	01MAY77	-0.750	0.500	25.00
97	08MAY77	1.000	1.500	-30.00
98	15MAY77	-4.500	-2.500	30.00

BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE NEAR FUTURES PRICE OF WHEAT, CORN, AND SOYBEANS FOLLOWING RELEASE OF EXPORT SALES REPT 1975 TO 1980 (CENTS/BU) CHICAGO BOARD OF TRADE SOURCE: CFTC

14:44 TUESDAY, SEPTEMBER 22, 1981

OBS	PKEND	WHEAT	PCORN	SOY
99	22MAY77	-2.50	-2.75	-30.00
100	29MAY77	-2.00	0.00	-20.50
101	05JUN77	-0.75	1.50	-8.00
102	12JUN77	-3.00	-0.75	-7.00
103	19JUN77	-0.50	-2.50	-30.00
104	26JUN77	-1.00	-0.50	5.75
105	03JUL77	-4.00	-4.75	-30.00
106	10JUL77	0.50	0.25	-7.50
107	17JUL77	-5.75	-2.75	1.50
108	24JUL77	0.50	0.50	5.50
109	31JUL77	0.50	-5.00	-26.50
110	07AUG77	0.75	1.75	-3.00
111	14AUG77	-1.25	-0.50	-26.50
112	21AUG77	-2.00	-1.50	-6.50
113	28AUG77	-1.75	-1.00	-0.75
114	04SEP77	2.00	1.50	0.75
115	11SEP77	3.00	1.50	-7.50
116	18SEP77	0.00	0.00	-0.75
117	25SEP77	1.50	0.50	4.50
118	02OCT77	1.50	-0.50	-9.75
119	09OCT77	-3.75	1.00	3.50
120	17OCT77	3.25	1.50	-8.75
121	23OCT77	1.50	0.00	3.25
122	30OCT77	0.50	1.25	2.50
123	06NOV77	2.75	-0.75	9.50
124	13NOV77	1.50	-2.50	-2.00
125	20NOV77	3.50	1.00	10.50
126	27NOV77	3.50	3.50	17.00
127	04DEC77	-1.50	0.75	2.50
128	11DEC77	-0.75	-1.25	-2.25
129	18DEC77	-1.00	-0.25	-6.25
130	24DEC77	3.50	-0.50	-2.00
131	02JAN78	-1.25	-0.75	0.25
132	08JAN78	3.50	0.75	0.50
133	15JAN78	-0.50	0.00	-4.00
134	22JAN78	2.75	2.00	3.75
135	29JAN78	2.50	1.50	0.50
136	05FEB78	-1.00	-0.25	-1.00
137	12FEB78	3.00	0.00	-0.50
138	19FEB78	0.50	1.25	2.00
139	26FEB78	-2.25	0.00	3.50
140	05MAR78	4.25	1.50	12.75
141	12MAR78	-3.75	-1.75	-27.25
142	19MAR78	13.00	7.00	30.00
143	26MAR78	0.00	2.50	4.50
144	02APR78	10.00	4.75	16.50
145	09APR78	7.00	3.75	13.75
146	16APR78	9.00	2.00	22.75
147	23APR78	-2.75	-2.00	15.25

BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE NEAR FUTURES PRICE
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES REPT
1975 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

OBS	WKEND	WHEAT	CORN	SOY
148	30APR76	5.75	2.50	16.00
149	07MAY76	3.00	-.75	9.50
150	14MAY76	4.00	-0.75	8.00
151	21MAY76	-0.25	-6.75	-7.25
152	28MAY76	-0.75	0.00	-9.50
153	04JUN76	-2.75	-4.50	-30.00
154	11JUN76	-7.00	-1.75	3.00
155	18JUN76	5.50	-0.50	0.50
156	25JUN76	-1.00	-1.50	-7.50
157	02JUL76	5.00	2.50	6.50
158	09JUL76	-0.50	-2.50	1.25
159	16JUL76	-1.25	0.50	-12.00
160	23JUL76	8.00	0.25	10.00
161	30JUL76	0.25	-0.50	5.00
162	06AUG76	2.00	-1.50	0.75
163	13AUG76	6.50	-5.50	7.50
164	20AUG76	3.25	3.25	0.75
165	27AUG76	2.00	-1.00	5.00
166	03SEP76	3.25	0.00	4.00
167	11SEP76	0.00	0.50	9.50
168	17SEP76	-5.50	-4.00	-5.75
169	24SEP76	5.00	-0.75	-5.25
170	01OCT76	-1.25	0.25	-2.75
171	08OCT76	-1.00	-3.00	-9.00
172	15OCT76	2.50	-2.25	3.00
173	22OCT76	-8.25	-1.00	-4.00
174	29OCT76	5.75	2.25	17.25
175	05NOV76	5.75	-0.25	7.75
176	12NOV76	6.25	0.25	10.00
177	19NOV76	0.50	0.25	7.00
178	26NOV76	7.50	0.75	3.75
179	03DEC76	-2.75	0.25	-2.00
180	10DEC76	-1.25	1.00	-4.25
181	17DEC76	4.50	0.50	4.25
182	24DEC76	1.50	1.00	-3.25
183	31DEC76	-1.25	-1.00	-0.75
184	07JAN77	-1.75	0.00	4.00
185	15JAN77	0.75	2.50	8.00
186	21JAN77	4.00	1.00	7.00
187	28JAN77	0.75	-0.50	-13.50
188	04FEB77	2.75	0.75	10.00
189	11FEB77	5.75	1.00	22.50
190	18FEB77	-3.50	0.50	3.00
191	25FEB77	-2.25	-0.75	8.00
192	04MAR77	-4.00	-0.75	-13.25
193	11MAR77	2.00	0.00	-3.00
194	18MAR77	-1.25	0.00	1.50
195	25MAR77	3.00	1.00	1.75
196	01APR77	-0.50	1.50	-2.00

BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE NEAR FUTURES PRICE OF WHEAT, CORN, AND SOYBEANS FOLLOWING RELEASE OF EXPORT SALES RPT

1975 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981

(CENTS/BU) CHICAGO BOARD OF TRADE

SOURCE: CFTC

OBS	NAME	WHEAT	CORN	SOY
197	08APR79	-1.50	2.50	10.50
198	15APR79	-1.75	-1.25	-17.00
199	22APR79	-0.50	-0.25	-4.25
200	29APR79	5.00	2.25	-5.50
201	06MAY79	1.00	1.75	2.00
202	13MAY79	5.50	-2.00	-9.50
203	20MAY79	-3.00	-0.75	-0.75
204	27MAY79	-5.25	0.00	-0.75
205	03JUN79	2.75	-1.00	-4.75
206	10JUN79	19.25	4.25	7.50
207	17JUN79	1.75	0.00	18.50
208	24JUN79	15.50	10.00	29.00
209	01JUL79	-17.00	1.75	-30.00
210	08JUL79	-1.00	-5.75	-2.50
211	15JUL79	-0.75	5.25	11.75
212	22JUL79	2.50	5.50	15.00
213	29JUL79	-8.00	-9.50	-19.75
214	05AUG79	-3.00	1.50	-2.75
215	12AUG79	-1.50	-1.75	4.75
216	19AUG79	0.50	-0.50	-5.00
217	26AUG79	7.50	2.25	4.25
218	02SEP79	0.75	0.50	-1.00
219	09SEP79	1.00	0.50	-1.00
220	16SEP79	-7.25	-4.75	-16.50
221	23SEP79	1.75	-1.50	-2.50
222	30SEP79	-5.25	-5.00	-1.50
223	07OCT79	-9.00	-2.25	-2.50
224	14OCT79	3.00	0.25	-0.50
225	21OCT79	10.25	3.75	-4.50
226	28OCT79	-17.50	-0.25	-12.50
227	04NOV79	3.25	3.00	4.25
228	11NOV79	2.00	1.00	1.25
229	18NOV79	3.50	-1.00	-2.00
230	25NOV79	-1.25	-0.75	-0.50
231	02DEC79	13.00	4.00	8.25
232	09DEC79	0.00	0.50	0.00
233	16DEC79	0.00	0.50	0.00
234	23DEC79	1.50	0.50	0.50
235	30DEC79	-1.50	2.00	0.00
236	06JAN80	-0.75	-2.50	-4.50
237	13JAN80	9.50	7.50	6.75
238	20JAN80	-2.50	-3.75	-0.50
239	27JAN80	-2.25	-1.75	-3.00
240	03FEB80	5.00	1.75	-4.50
241	10FEB80	-1.25	-0.50	-4.00
242	17FEB80	0.50	-1.00	-5.50
243	24FEB80	-1.50	-1.75	-3.25
244	02MAR80	-2.25	-1.50	-4.00
245	09MAR80	-1.00	-1.50	-6.00

BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE NEAR FUTURES PRICE
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES REPT
1979 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

OBS	WKEND	WHEAT	PCORN	SOY
245	10MAR80	0.00	2.75	4.00
247	24MAR80	-0.75	-2.25	-5.50
248	31MAR80	-14.50	1.25	-1.75
249	07APR80	-3.25	4.25	1.75
250	14APR80	-13.50	-2.50	0.25
251	21APR80	17.75	-1.75	-4.25
252	28APR80	-9.25	1.75	8.50
253	05MAY80	4.50	0.75	3.00
254	12MAY80	-3.50	-1.00	2.00
255	19MAY80	-11.50	-3.50	-7.00
256	27MAY80	-5.00	0.25	2.00
257	01JUN80	0.50	1.50	-1.00
258	05JUN80	-2.00	0.00	-1.00
259	19JUN80	-0.50	1.25	2.75

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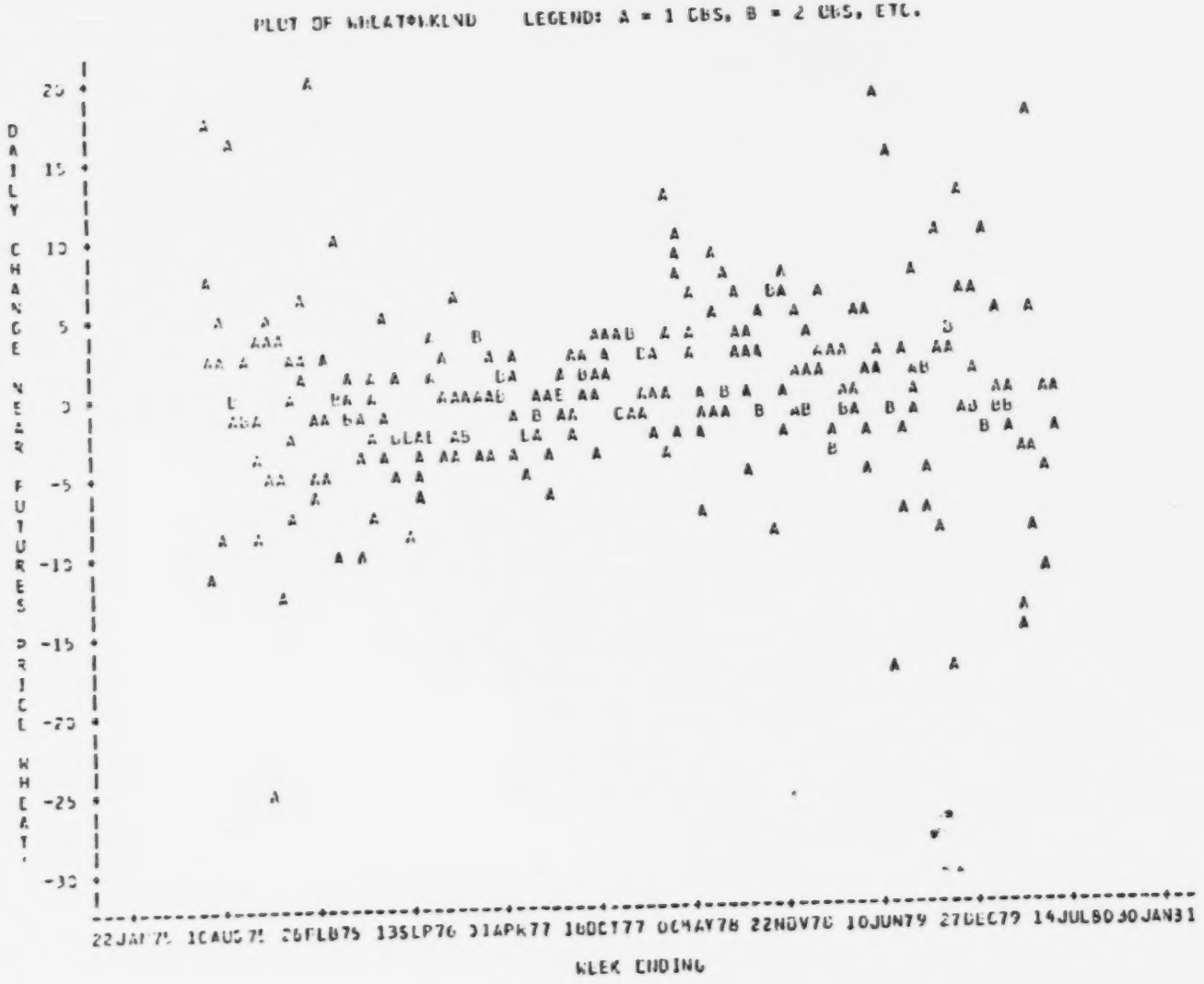
BEST DOCUMENT AVAILABLE

DAILY CHANGE IN THE YEAR FUTURES PRICE
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES RLPT
1975 TO 1980 14:44 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WHEAT	259	0.05297297	5.5506250	-25.0000000	20.0000000	0.34489905	13.720000	30.809437
CORN	259	-0.01805019	2.7304369	-9.5000000	10.1250000	0.16966110	-4.675000	7.455286
SOY	259	0.43001931	10.9031752	-30.0000000	30.0000000	0.67749034	111.375000	118.879229



195 BEST DOCUMENT AVAILABLE

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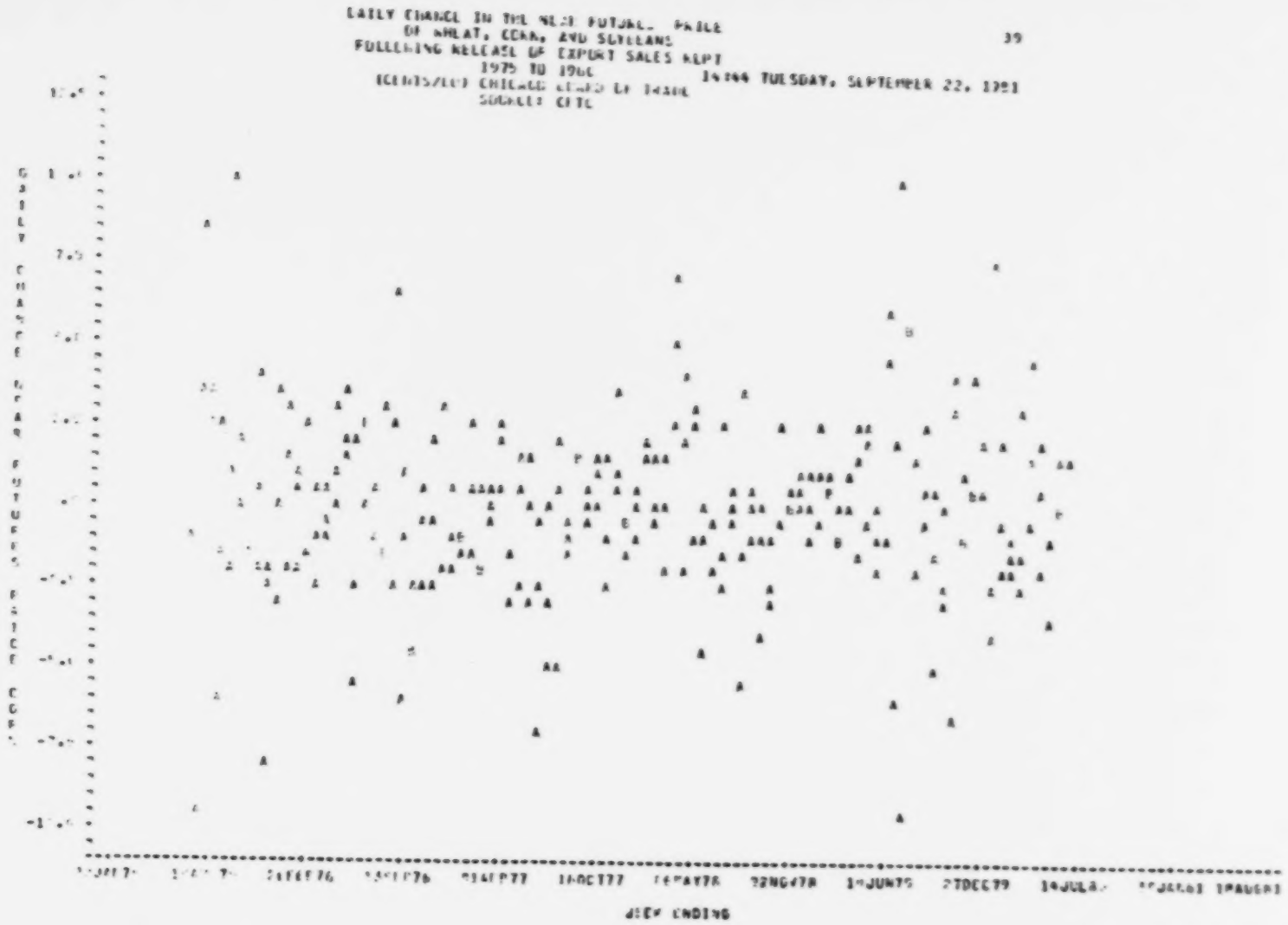
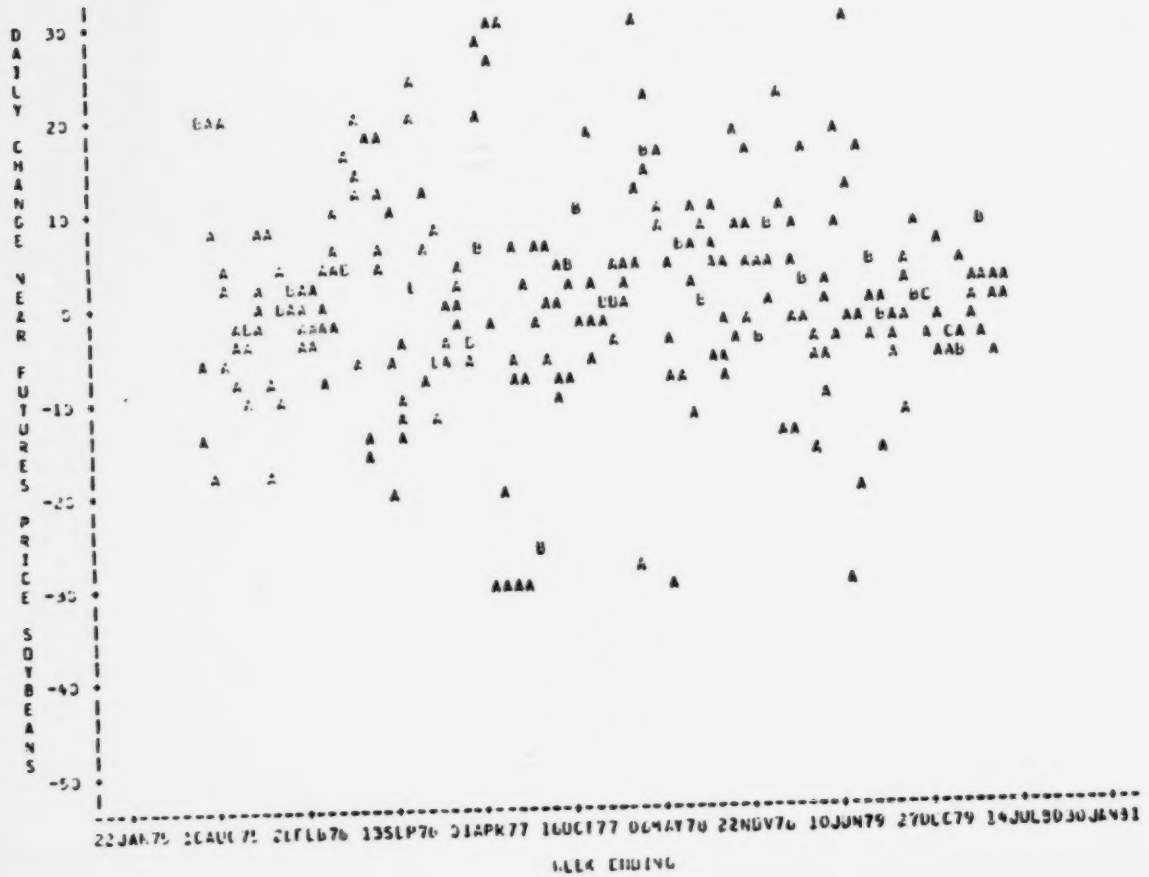

DAILY CHANGE IN THE NEAR FUTURE PRICE OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES REPT
1975 TO 1980
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC
39
34444 TUESDAY, SEPTEMBER 22, 1981
DAILY CHANGE IN NEAR FUTURES PRICE (CBT)
WEEK ENDING

DAILY CHANGE IN THE NEAR FUTURES PRICE
OF WHEAT, CORN, AND SOYBEANS
FOLLOWING RELEASE OF EXPORT SALES RPT
1975 TO 1980 14144 TUESDAY, SEPTEMBER 22, 1981
(CENTS/BU) CHICAGO BOARD OF TRADE
SOURCE: CFTC

PLOT OF SOYBEAN LEGEND: A = 1 OBS, B = 2 OBS, ETC.



BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

SOURCE: JSCA EXPORT SALES REPORTING DIV

DES	WKEND	WHEATT	WHEATC	WHEATA	BARLT	BARLC	BARLN	CORNT	CORNC	CORNA	SOYT	SOYC	SOYN
1	06JUL75	-8.0	-8.0	0.0	0.0	0.0	0.0	.	59.0	.	.	33.0	.
2	13JUL75	41.0	41.0	0.0	0.0	0.0	0.0	.	80.0	.	.	27.0	.
3	20JUL75	93.0	93.0	0.0	-2.0	-2.0	0.0	.	-36.0	.	.	-61.0	.
4	27JUL75	137.0	137.0	0.0	0.0	0.0	0.0	.	3.0	.	.	47.0	.
5	03AUG75	49.0	49.0	0.0	0.0	0.0	0.0	-117.0	-239.0	122.0	70.0	4.0	66.0
6	10AUG75	10.0	10.0	0.0	0.0	0.0	0.0	120.0	56.0	70.0	36.0	23.0	13.0
7	17AUG75	141.0	141.0	0.0	0.0	0.0	0.0	73.0	24.0	49.0	26.0	3.0	23.0
8	24AUG75	51.0	51.0	0.0	0.0	0.0	0.0	144.0	-13.0	157.0	113.0	23.0	90.0
9	31AUG75	74.0	74.0	-0.0	0.0	0.0	0.0	31.0	0.0	31.0	61.0	0.0	61.0
10	07SEP75	10.0	10.0	0.0	0.0	0.0	0.0	73.0	25.0	48.0	-17.0	-17.0	0.0
11	14SEP75	-35.0	-35.0	0.0	0.0	0.0	0.0	245.0	-75.0	321.0	50.0	50.0	0.0
12	21SEP75	100.0	100.0	0.0	0.0	0.0	0.0	191.0	-126.0	317.0	-75.0	-75.0	0.0
13	28SEP75	60.0	60.0	0.0	0.0	0.0	0.0	44.0	-114.0	158.0	26.0	26.0	0.0
14	05OCT75	32.0	32.0	0.0	0.0	0.0	0.0	93.0	93.0	0.0	15.0	15.0	0.0
15	12OCT75	20.0	20.0	0.0	30.0	30.0	0.0	105.0	105.0	0.0	50.0	50.0	0.0
16	19OCT75	101.0	5.0	96.0	-30.0	-30.0	0.0	74.0	74.0	0.0	75.0	75.0	0.0
17	26OCT75	142.0	142.0	0.0	0.0	0.0	0.0	99.0	99.0	0.0	10.0	10.0	0.0
18	02NOV75	-64.0	-64.0	0.0	0.0	0.0	0.0	165.0	165.0	0.0	74.0	74.0	0.0
19	09NOV75	141.0	141.0	---	0.0	0.0	0.0	70.0	70.0	0.0	4.0	4.0	0.0
20	16NOV75	-29.0	-29.0	---	0.0	0.0	0.0	159.0	159.0	0.0	38.0	38.0	0.0
21	23NOV75	46.0	46.0	---	0.0	0.0	0.0	61.0	61.0	0.0	75.0	75.0	0.0
22	30NOV75	1.0	-1.0	2.0	0.0	0.0	0.0	-10.0	-10.0	0.0	20.0	20.0	0.0
23	07DEC75	30.0	30.0	0.0	0.0	0.0	0.0	10.0	10.0	0.0	29.0	29.0	0.0
24	14DEC75	-112.0	-112.0	0.0	0.0	0.0	0.0	-65.0	-65.0	0.0	60.0	60.0	0.0
25	21DEC75	1.0	1.0	0.0	0.0	0.0	0.0	22.0	22.0	0.0	57.0	57.0	0.0
26	28DEC75	-72.0	-72.0	0.0	0.0	0.0	0.0	-99.0	-99.0	0.0	3.0	3.0	0.0
27	04JAN76	-249.0	-249.0	0.0	0.0	0.0	0.0	-127.0	-127.0	0.0	-33.0	-33.0	0.0
28	11JAN76	-100.0	-100.0	0.0	0.0	0.0	0.0	-93.0	-20.0	0.0	72.0	72.0	0.0
29	18JAN76	49.0	-17.0	66.0	8.0	8.0	0.0	92.0	92.0	0.0	-43.0	-43.0	0.0
30	25JAN76	-15.0	-15.0	0.0	8.0	8.0	0.0	293.0	293.0	0.0	31.0	0.0	25.0
31	01FEB76	10.0	-10.0	20.0	0.0	0.0	0.0	110.0	110.0	0.0	39.0	39.0	0.0
32	08FEB76	97.0	-5.0	102.0	0.0	0.0	0.0	-20.0	-20.0	0.0	54.0	54.0	0.0
33	15FEB76	100.4	68.1	46.3	5.4	5.4	0.0	75.3	70.3	0.0	60.2	37.6	25.4
34	22FEB76	20.3	20.3	0.0	0.0	0.0	0.0	9.6	9.6	0.0	23.3	23.3	0.0
35	29FEB76	39.6	14.3	26.3	10.6	5.4	5.4	167.6	82.2	85.4	167.6	82.4	85.4
36	07MAR76	15.6	-9.5	20.2	15.7	9.6	16.9	176.2	176.2	0.0	37.7	12.3	25.4
37	14MAR76	22.2	1.9	20.3	16.3	0.0	16.3	183.3	183.3	0.0	21.1	21.1	0.0
38	21MAR76	20.6	-5.4	25.4	5.4	0.0	5.4	-50.3	-50.3	0.0	23.6	23.6	0.0
39	28MAR76	-43.7	-109.7	61.4	0.0	0.0	0.0	75.1	10.2	58.9	60.5	60.5	0.0
40	04APR76	1.2	-10.1	11.3	10.9	10.9	0.0	-5.2	-25.2	0.0	98.9	93.9	0.0
41	11APR76	-8.5	-49.1	40.6	0.0	0.0	0.0	113.9	118.9	0.0	-19.8	-19.8	0.0
42	18APR76	20.3	0.0	20.3	0.0	0.0	0.0	169.6	87.3	82.3	33.5	33.5	0.0
43	25APR76	5.1	-15.2	20.3	0.0	0.0	0.0	147.5	90.1	37.4	17.0	17.0	0.0
44	02MAY76	0.0	0.0	0.0	0.0	0.0	0.0	-2.0	-2.0	0.0	52.2	52.2	0.0
45	09MAY76	-10.2	-10.2	0.0	20.7	20.7	0.0	75.9	75.9	0.0	105.8	105.8	0.0
46	16MAY76	35.5	-5.1	40.6	20.6	5.4	15.2	175.9	155.6	20.3	169.1	93.9	75.2
47	23MAY76	20.3	0.0	20.3	-13.4	-13.4	0.0	214.5	-33.1	251.6	93.4	93.4	0.0
48	30MAY76	30.1	-10.5	40.6	0.0	0.0	0.0	114.9	57.7	57.2	31.8	31.8	0.0
49	06JUN76	43.6	43.6	0.0	21.8	21.8	0.0	-77.6	-77.6	0.0	88.7	88.7	0.0
50	13JUN76	100.6	100.6	0.0	29.0	29.0	0.0	299.3	16.9	282.4	71.1	71.1	0.0
51	20JUN76	37.5	37.5	0.0	16.9	16.9	0.0	177.2	1.0	176.2	59.4	46.2	13.2

SOURCE: USDA EXPORT SALES REPORTING DIV

OBS	WEEK	WHEATT	WHEATC	WHEATN	BARLT	BARLC	BARLN	CORNT	CORNC	CORN	SOYT	SOYC	SOYN
52	27JUL 76	61.3	61.3	0.0	0.0	0.0	0.0	52.1	46.7	25.4	30.5	24.4	6.1
53	03AUG 76	57.9	57.9	0.0	5.4	5.4	0.0	14.0	6.4	7.6	36.3	26.3	12.0
54	11AUG 76	-0.2	-0.2	0.0	0.0	0.0	0.0	93.5	90.0	40.5	10.3	-22.1	32.4
55	18AUG 76	76.6	76.6	0.0	5.4	5.4	0.0	260.6	78.2	184.4	126.2	45.5	80.7
56	25AUG 76	224.2	224.2	0.0	-30.2	-30.2	0.0	617.7	10.2	607.5	76.6	46.3	30.3
57	01SEP 76	147.7	147.7	0.0	0.0	0.0	0.0	524.5	-3.5	528.0	46.6	21.2	25.4
58	08SEP 76	135.9	135.9	0.0	121.7	121.7	0.0	97.5	-5.5	103.0	-0.0	-15.1	9.1
59	15SEP 76	277.9	277.9	0.0	-5.4	-5.4	0.0	49.4	-8.5	57.9	95.7	72.7	23.0
60	22SEP 76	84.0	84.0	0.0	0.0	0.0	0.0	153.3	40.3	113.0	116.3	58.9	57.4
61	29SEP 76	41.0	41.0	0.0	0.0	0.0	0.0	61.5	4.6	56.9	48.7	18.3	30.4
62	06OCT 76	100.7	95.9	50.8	16.3	16.3	0.0	6.6	-50.8	57.4	64.5	64.5	0.0
63	13OCT 76	78.8	78.8	0.0	13.0	13.0	0.0	171.7	-40.0	211.7	14.5	14.5	0.0
64	20OCT 76	69.5	69.5	0.0	13.6	13.6	0.0	356.3	70.9	285.4	59.7	59.7	0.0
65	27OCT 76	15.2	15.2	0.0	-1.2	-1.2	0.0	75.8	-1.7	77.5	55.5	55.5	0.0
66	03NOV 76	121.9	121.9	0.0	17.0	17.0	0.0	43.4	43.4	0.0	67.8	67.8	0.0
67	10NOV 76	20.0	20.0	0.0	16.3	16.3	0.0	19.1	19.1	0.0	50.7	50.7	0.0
68	17NOV 76	104.6	104.6	0.0	-2.7	-2.7	0.0	101.2	101.2	0.0	64.9	64.9	0.0
69	24NOV 76	-15.0	-15.0	0.0	16.3	16.3	0.0	142.4	142.4	0.0	69.9	69.9	0.0
70	01DEC 76	4.6	4.6	0.0	26.1	26.1	0.0	28.1	28.1	0.0	110.2	110.2	0.0
71	08DEC 76	20.5	20.5	0.0	0.0	0.0	0.0	136.3	136.3	0.0	-22.6	-22.6	0.0
72	15DEC 76	21.3	-4.1	25.4	29.4	7.6	21.8	149.8	149.8	0.0	66.9	66.9	0.0
73	22DEC 76	13.2	-13.7	27.0	0.0	0.0	0.0	18.8	18.8	0.0	134.8	100.3	34.5
74	29DEC 76	24.0	20.3	74.3	0.0	0.0	0.0	-90.0	-90.0	0.0	73.3	47.9	25.4
75	05JAN 77	68.1	68.1	0.0	39.6	-14.9	54.5	132.6	132.6	0.0	96.6	96.6	0.0
76	12JAN 77	-10.6	-81.3	71.1	0.6	0.6	0.0	55.4	55.4	0.0	51.2	48.7	2.5
77	19JAN 77	-20.3	-20.3	0.0	0.0	0.0	0.0	51.9	26.5	25.4	65.1	65.1	0.0
78	26JAN 77	0.0	0.0	0.0	-16.3	-16.3	0.0	30.2	30.2	0.0	21.3	21.3	0.0
79	02FEB 77	-81.0	-81.0	0.0	-1.4	-1.4	0.0	20.8	20.8	0.0	84.6	84.6	0.0
80	09FEB 77	-0.1	-0.1	0.0	19.6	19.6	0.0	6.9	6.9	0.0	98.5	98.5	0.0
81	16FEB 77	66.0	66.0	0.0	5.4	5.4	0.0	195.6	195.6	0.0	283.0	278.9	4.1
82	23FEB 77	20.3	20.3	20.5	10.9	10.9	0.0	247.0	247.0	0.0	128.2	128.2	0.0
83	02MAR 77	73.8	73.8	0.0	5.4	5.4	0.0	32.0	32.0	0.0	76.7	70.6	6.1
84	09MAR 77	81.0	81.0	0.0	5.6	0.2	5.4	55.0	55.0	0.0	128.8	125.7	3.1
85	16MAR 77	101.3	81.0	20.3	10.8	5.4	5.4	-41.3	-41.3	0.0	16.0	16.0	0.0
86	23MAR 77	20.9	45.7	-15.2	5.2	5.2	0.0	39.9	39.9	0.0	21.6	21.6	0.0
87	30MAR 77	46.7	40.6	5.1	10.9	0.0	10.9	266.0	266.0	0.0	65.8	65.8	0.0
88	06APR 77	22.1	-20.6	42.7	10.9	5.5	5.4	56.3	56.3	0.0	123.5	123.5	0.0
89	13APR 77	25.0	-40.6	65.6	0.0	0.0	0.0	237.5	126.7	60.8	49.1	37.4	11.7
90	20APR 77	70.1	0.0	70.1	0.0	0.0	0.0	77.4	77.4	0.0	133.4	116.6	15.8
91	27APR 77	-17.3	3.0	-20.3	0.0	0.0	0.0	194.6	167.9	26.7	127.3	63.3	64.0
92	04MAY 77	-5.1	-25.3	-25.4	5.4	5.4	0.0	102.9	102.9	0.0	282.3	198.5	23.8
93	11MAY 77	56.9	16.3	40.6	27.2	21.8	5.4	53.5	13.9	39.6	188.3	183.2	5.1
94	18MAY 77	87.9	-15.5	103.4	0.0	0.0	0.0	60.2	60.2	0.0	234.3	219.3	15.0
95	25MAY 77	25.6	5.5	17.0	16.3	0.0	16.3	225.7	225.7	0.0	101.0	101.0	0.0
96	01JUN 77	-13.1	-27.1	14.0	-5.5	-10.9	5.4	81.8	67.3	14.5	57.0	40.7	16.3
97	08JUN 77	28.4	3.6	25.4	0.0	0.0	0.0	79.0	26.0	53.0	122.8	121.8	1.0
98	15JUN 77	45.7	-16.9	62.6	0.0	-5.4	5.4	99.9	-20.0	120.9	64.7	61.7	3.0
99	22JUN 77	-5.4	-26.6	20.0	2.7	2.7	0.0	59.9	-20.9	80.8	26.0	21.0	5.0
100	29JUN 77	2.2	-23.2	25.4	0.0	0.0	0.0	52.6	24.2	28.4	51.5	49.5	2.0
101	05JUL 77	12.7	12.7	0.0	11.5	11.5	0.0	52.8	52.8	0.0	27.6	27.6	0.0
102	12JUL 77	25.4	25.4	0.0	0.0	0.0	0.0	195.8	140.3	55.5	88.5	83.4	5.1

BEST DOCUMENT AVAILABLE

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OBS	WEEK	WHEATT	WHEATC	WHEATN	BARLT	BARLC	BARLN	CORNT	CORNC	CORN	SOYT	SOYC	SOYN
103	19JUN77	14.0	14.0	0.0	-10.1	-10.1	0.0	-11.5	153.4	58.4	103.4	55.6	47.8
104	26JUN77	5.1	5.1	0.0	-8.2	-8.2	0.0	-52.5	-137.5	85.0	74.7	24.0	50.7
105	03JUL77	45.7	45.7	0.0	5.4	5.4	0.0	37.6	31.5	6.1	60.4	48.2	12.2
106	10JUL77	21.4	21.4	0.0	16.2	16.2	0.0	87.0	33.2	53.8	71.0	54.7	16.3
107	17JUL77	25.4	25.4	0.0	3.9	3.9	0.0	66.8	16.0	50.8	88.2	37.7	50.5
108	24JUL77	-10.8	-10.8	0.0	17.1	17.1	0.0	58.7	5.1	53.8	95.1	-43.3	138.4
109	31JUL77	-9.4	-9.4	0.0	27.2	27.2	0.0	100.7	9.2	91.5	127.4	78.2	49.2
110	07AUG77	16.4	16.4	0.0	-16.3	-16.3	0.0	21.0	4.3	16.7	65.7	-19.9	85.6
111	14AUG77	7.4	7.4	0.0	10.9	10.9	0.0	-10.6	-20.5	9.7	25.2	-30.5	55.7
112	21AUG77	28.6	28.6	0.0	0.0	0.0	0.0	110.7	65.0	45.7	58.3	12.6	45.7
113	28AUG77	32.3	32.3	0.0	55.9	55.9	0.0	34.4	7.0	25.4	74.6	3.6	71.0
114	04SEP77	-5.3	-5.3	0.0	48.2	48.2	0.0	43.7	15.3	28.4	114.4	114.4	0.0
115	11SEP77	0.0	0.0	0.0	0.0	0.0	0.0	14.0	14.0	0.0	44.5	44.5	0.0
116	18SEP77	0.0	0.0	0.0	-27.0	-27.0	0.0	-61.6	-11.4	273.0	40.0	40.0	0.0
117	25SEP77	-14.9	-14.9	0.0	25.5	25.5	0.0	37.2	0.0	37.2	72.8	72.8	0.0
118	02OCT77	-2.3	-2.3	0.0	-21.2	-21.2	0.0	62.1	62.1	0.0	92.2	92.2	0.0
119	09OCT77	-13.1	-13.1	0.0	0.0	0.0	0.0	134.7	134.7	0.0	98.7	98.7	0.0
120	17OCT77	-2.9	-2.9	0.0	5.4	5.4	0.0	25.4	25.4	0.0	117.1	117.1	0.0
121	23OCT77	46.6	46.6	0.0	0.0	0.0	0.0	113.8	113.8	0.0	56.6	56.6	0.0
122	30OCT77	-15.2	-15.2	0.0	0.0	0.0	0.0	-14.2	-14.2	0.0	144.8	144.8	0.0
123	06NOV77	71.1	95.7	-24.6	-1.0	-1.0	0.0	254.6	254.6	0.0	153.8	128.4	25.4
124	13NOV77	20.3	20.3	0.0	10.9	10.9	0.0	192.1	192.1	0.0	208.2	208.2	0.0
125	20NOV77	40.6	40.6	0.0	-34.3	-34.3	0.0	58.9	58.9	0.0	83.4	83.4	0.0
126	27NOV77	96.1	96.1	0.0	-27.2	-27.2	0.0	-21.9	-21.9	0.0	50.4	50.4	0.0
127	04DEC77	31.5	31.5	0.0	6.5	1.1	5.4	32.5	32.5	0.0	46.0	46.0	0.0
128	11DEC77	95.7	95.7	0.0	-18.2	-18.2	0.0	183.8	183.8	0.0	96.0	93.0	3.0
129	18DEC77	60.8	60.8	0.0	0.0	0.0	0.0	93.1	93.1	0.0	160.0	159.0	1.0
130	25DEC77	54.0	54.0	0.0	16.3	5.4	10.9	32.5	32.5	0.0	107.4	106.4	1.0
131	01JAN78	17.4	17.4	0.0	0.0	0.0	0.0	99.0	99.0	0.0	-7.1	-12.2	5.1
132	08JAN78	38.8	13.2	25.4	0.0	0.0	0.0	65.5	65.5	0.0	140.9	134.3	6.6
133	15JAN78	42.5	42.5	0.0	0.0	0.0	0.0	-5.1	-5.1	0.0	91.2	91.2	0.0
134	22JAN78	69.1	69.1	0.0	10.9	10.9	0.0	-45.3	-45.3	0.0	104.8	73.9	30.9
135	29JAN78	20.6	15.2	5.4	0.0	0.0	0.0	113.4	113.4	0.0	125.5	106.2	19.3
136	05FEB78	-40.6	-40.6	0.0	0.0	0.0	0.0	-40.7	-40.7	0.0	80.5	72.4	8.1
137	12FEB78	234.9	234.9	0.0	0.0	0.0	0.0	-52.2	-52.2	0.0	-13.8	-13.8	0.0
138	19FEB78	77.7	77.7	0.0	5.4	5.4	0.0	68.9	68.9	0.0	81.0	55.6	25.4
139	26FEB78	61.0	35.6	25.4	0.0	0.0	0.0	99.0	99.0	0.0	89.3	51.9	32.4
140	05MAR78	0.0	0.0	0.0	0.0	0.0	0.0	30.1	30.1	0.0	93.7	93.7	0.0
141	12MAR78	79.1	44.1	35.0	0.0	0.0	0.0	24.4	24.4	0.0	48.9	49.9	-1.0
142	19MAR78	37.8	37.8	0.0	-5.4	-5.4	0.0	42.8	42.8	0.0	-35.1	-35.1	0.0
143	26MAR78	16.4	-9.0	25.4	5.4	0.0	5.4	-0.4	-0.4	0.0	52.7	37.5	15.2
144	02APR78	12.2	9.5	2.7	5.4	0.0	5.4	-50.9	-50.9	0.0	49.7	35.5	14.2
145	09APR78	279.5	101.7	177.8	5.4	0.0	5.4	388.3	388.3	0.0	48.7	44.1	4.6
146	16APR78	91.4	15.8	66.0	21.2	21.2	0.0	124.7	124.7	0.0	46.5	26.2	20.3
147	23APR78	40.5	-9.7	50.2	0.0	0.0	0.0	105.7	55.1	50.6	97.2	74.8	22.4
148	30APR78	157.1	4.7	152.4	0.0	0.0	0.0	0.0	0.0	0.0	129.2	62.1	67.1
149	07MAY78	108.4	-14.9	123.2	0.0	0.0	0.0	80.6	80.6	0.0	52.2	17.1	35.1
150	14MAY78	115.1	110.1	0.0	0.0	0.0	0.0	161.2	161.2	0.0	34.6	34.6	0.0
151	21MAY78	71.1	34.9	36.2	0.0	0.0	0.0	108.2	77.7	30.5	118.5	109.4	9.1
152	28MAY78	99.4	-57.5	101.9	16.3	16.3	0.0	0.4	0.4	0.0	34.9	25.8	9.1
153	04JUN78	112.6	112.6	0.0	5.4	5.4	0.0	170.3	43.3	127.0	44.7	31.5	13.2

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154	13JUL78	34.6	34.6	0.0	10.9	10.9	0.0	24.6	24.6	0.0	66.9	45.4	15.5
155	20JUL78	26.9	26.9	0.0	0.0	0.0	0.0	0.0	-25.4	25.4	66.4	26.1	42.3
156	27JUL78	95.6	95.6	0.0	9.5	9.5	0.0	72.1	97.5	-25.4	69.1	36.7	29.4
157	03AUG78	179.5	179.5	0.0	5.4	5.4	0.0	10.5	34.5	-24.0	54.5	54.5	0.0
158	10AUG78	-82.7	-82.7	0.0	-5.4	-5.4	0.0	149.5	48.0	101.6	40.5	23.7	16.8
159	17AUG78	116.3	116.3	0.0	-5.4	-5.4	0.0	101.6	50.8	50.8	59.4	48.2	11.2
160	24AUG78	10.9	10.9	0.0	0.0	0.0	0.0	51.5	26.1	25.4	85.0	32.5	53.1
161	31AUG78	-59.1	-59.1	0.0	2.7	2.7	0.0	22.0	22.0	0.0	125.3	33.9	91.4
162	07SEP78	130.0	130.0	0.0	0.0	0.0	0.0	-165.3	-8.1	-157.2	92.9	-4.6	97.5
163	14SEP78	40.2	40.2	0.0	0.0	0.0	0.0	87.5	87.5	0.0	90.9	40.6	50.3
164	21SEP78	-12.9	-12.9	0.0	16.3	16.3	0.0	146.1	90.2	55.9	44.4	0.0	44.4
165	28SEP78	-39.6	-39.6	0.0	8.1	8.1	0.0	-25.4	-76.0	50.6	-50.2	-123.3	65.1
166	05OCT78	-50.4	-50.4	0.0	5.4	5.4	0.0	69.4	0.0	89.4	120.3	120.3	0.0
167	12OCT78	27.5	27.5	0.0	16.3	16.3	0.0	126.3	30.5	97.8	22.0	22.0	0.0
168	19OCT78	24.2	24.2	0.0	44.9	0.0	44.9	0.0	0.0	0.0	70.0	70.0	0.0
169	26OCT78	25.4	25.4	0.0	10.9	10.9	0.0	187.4	-50.8	238.2	117.8	117.8	0.0
170	02NOV78	46.9	46.9	0.0	10.9	10.9	0.0	267.1	267.1	0.0	69.4	69.4	0.0
171	09NOV78	2.0	2.0	0.0	5.4	5.4	0.0	264.9	264.9	0.0	75.6	72.0	3.6
172	16NOV78	-24.6	-24.6	0.0	10.9	10.9	0.0	190.5	190.0	0.0	135.6	134.1	1.5
173	22NOV78	-32.9	-32.9	0.0	0.0	0.0	0.0	-5.8	-5.8	0.0	90.8	90.8	0.0
174	29NOV78	15.2	7.7	7.6	0.0	0.0	0.0	53.3	53.8	0.0	47.5	41.4	6.1
175	06DEC78	-8.2	-8.2	0.0	0.0	0.0	0.0	-0.4	-0.4	0.0	263.9	263.9	0.0
176	13DEC78	12.6	12.6	0.0	0.0	0.0	0.0	86.4	86.4	0.0	243.8	243.8	0.0
177	19DEC78	119.4	119.4	0.0	-29.9	-29.9	0.0	82.0	82.0	0.0	160.3	160.3	0.0
178	26DEC78	56.6	56.6	0.0	0.0	0.0	0.0	280.4	280.4	0.0	179.8	179.8	0.0
179	02JAN79	14.6	14.6	0.0	-2.7	-2.7	0.0	59.6	59.6	0.0	202.3	202.3	0.0
180	10JAN79	25.8	25.8	0.0	0.0	0.0	0.0	-70.5	-70.5	0.0	54.0	54.0	0.0
181	17JAN79	92.2	42.2	50.0	0.0	0.0	0.0	75.4	75.4	0.0	0.7	0.7	0.0
182	24JAN79	7.6	7.6	0.0	0.0	0.0	0.0	58.2	58.2	0.0	10.3	10.3	0.0
183	31JAN79	39.6	39.6	0.0	0.0	0.0	0.0	-39.5	-39.5	0.0	-31.5	-31.5	0.0
184	07FEB79	101.6	101.6	0.0	0.0	0.0	0.0	82.8	82.8	0.0	115.1	113.1	2.0
185	14FEB79	25.4	25.4	0.0	0.0	0.0	0.0	154.0	154.0	0.0	94.3	94.3	0.0
186	21FEB79	25.4	25.4	0.0	0.0	0.0	0.0	104.1	104.1	0.0	32.1	32.1	0.0
187	28FEB79	40.2	40.2	0.0	0.0	0.0	0.0	90.4	90.4	0.0	37.9	37.9	0.0
188	07MAR79	25.4	0.0	25.4	0.0	0.0	0.0	132.9	132.9	0.0	67.0	67.0	0.0
189	14MAR79	25.4	25.4	0.0	0.0	0.0	0.0	224.5	224.5	0.0	246.0	246.0	0.0
190	21MAR79	-92.2	-92.2	0.0	0.0	0.0	0.0	130.2	130.2	0.0	198.7	198.7	0.0
191	28MAR79	-18.2	-18.2	0.0	5.4	5.4	0.0	5.1	5.1	0.0	100.0	54.8	45.2
192	04APR79	-3.1	-3.1	0.0	0.0	0.0	0.0	91.4	91.4	0.0	107.5	107.5	0.0
193	11APR79	-5.4	-5.4	0.0	0.0	0.0	0.0	175.7	175.7	0.0	180.7	115.2	65.5
194	18APR79	57.7	10.7	46.0	0.0	0.0	0.0	155.1	155.1	0.0	100.6	100.6	0.0
195	25APR79	50.4	0.0	50.4	0.0	0.0	0.0	50.8	50.8	0.0	46.9	33.4	13.5
196	02MAY79	38.3	-12.2	50.5	0.0	0.0	0.0	90.8	38.0	52.8	40.6	30.4	10.2
197	09MAY79	-33.6	-33.6	0.0	15.2	0.0	15.2	90.8	50.8	50.0	75.1	73.1	2.0
198	16MAY79	50.0	0.0	50.0	0.0	0.0	0.0	100.9	50.8	50.0	35.7	35.7	0.0
199	23MAY79	-5.4	0.0	-21.4	0.0	0.0	0.0	245.1	143.5	101.6	40.3	40.3	0.0
200	29MAY79	-40.2	-40.3	0.0	10.9	10.9	0.0	191.8	161.3	30.5	1.2	1.2	0.0
201	06JUN79	97.0	8.1	81.9	0.0	0.0	0.0	-10.1	-40.6	30.5	52.9	48.8	4.1
202	13JUN79	-12.2	6.4	-11.7	3.6	3.6	0.0	99.8	11.6	83.2	101.2	55.5	45.7
203	20JUN79	30.5	-25.4	51.9	0.0	0.0	0.0	87.3	87.3	0.0	60.9	55.8	5.1
204	27JUN79	0.0	0.0	0.0	-43.5	-43.5	0.0	4.4	4.4	0.0	64.5	58.4	6.1

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OBS	WKEND	WHEATT	WHEATC	WHEATN	BARLT	BARLC	BARLN	CORNT	CORNC	CORN	SOYT	SOYC	SOYN
205	03JUN79	28.5	28.5	0.0	14.5	14.5	0.0	25.4	25.4	0.0	78.2	57.4	20.8
206	10JUN79	46.2	46.2	0.0	0.0	0.0	0.0	-6.8	-57.6	50.8	103.8	74.8	29.0
207	17JUN79	17.2	17.2	0.0	0.0	0.0	0.0	120.6	10.6	110.0	103.1	26.4	76.7
208	24JUN79	10.9	10.9	0.0	5.4	5.4	0.0	278.9	278.9	0.0	197.3	146.5	50.8
209	01JUL79	50.0	50.0	0.0	0.0	0.0	0.0	159.3	84.3	75.0	106.3	70.5	35.8
210	08JUL79	126.2	126.2	0.0	0.0	0.0	0.0	61.0	61.0	0.0	34.1	23.9	10.2
211	15JUL79	65.7	65.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125.7	-52.1	177.8
212	22JUL79	38.3	38.3	0.0	0.0	0.0	0.0	25.0	25.0	0.0	12.3	10.3	2.0
213	29JUL79	-37.8	-37.8	0.0	0.0	0.0	0.0	207.0	-19.2	226.2	10.9	5.8	5.1
214	05AUG79	4.4	4.4	0.0	0.0	0.0	0.0	65.3	-14.7	100.0	19.8	0.0	19.8
215	12AUG79	110.9	110.9	0.0	0.0	0.0	0.0	201.7	-0.7	202.4	20.8	-26.5	47.3
216	19AUG79	127.8	127.8	0.0	0.0	0.0	0.0	111.2	-254.6	365.8	18.3	0.0	18.3
217	26AUG79	91.3	91.3	0.0	0.0	0.0	0.0	263.5	34.9	228.6	67.7	0.0	67.7
218	02SEP79	-25.6	-25.6	0.0	0.0	0.0	0.0	-7.8	-27.5	19.7	31.6	31.6	0.0
219	09SEP79	5.5	5.5	0.0	0.0	0.0	0.0	75.9	50.5	25.4	187.8	187.8	0.0
220	16SEP79	63.6	63.6	0.0	0.0	0.0	0.0	51.0	8.5	42.5	91.3	91.3	0.0
221	23SEP79	36.6	36.6	0.0	0.0	0.0	0.0	-40.4	-32.0	-8.4	61.8	61.8	0.0
222	30SEP79	185.7	78.2	107.5	0.0	0.0	0.0	25.0	-14.8	39.8	68.3	68.3	0.0
223	07OCT79	50.6	50.6	0.0	0.0	0.0	0.0	15.2	15.2	0.0	74.4	74.4	0.0
224	14OCT79	138.0	107.5	30.5	0.0	0.0	0.0	147.4	147.4	0.0	73.1	73.1	0.0
225	21OCT79	58.3	58.3	0.0	0.0	0.0	0.0	36.6	36.6	0.0	134.4	134.4	0.0
226	29OCT79	12.9	12.9	0.0	0.0	0.0	0.0	62.8	62.8	0.0	84.4	84.4	0.0
227	04NOV79	25.4	0.0	25.4	0.0	0.0	0.0	54.3	54.3	0.0	109.0	109.0	0.0
228	11NOV79	-28.7	-28.7	0.0	0.0	0.0	0.0	59.7	59.7	0.0	-1.6	-1.6	0.0
229	18NOV79	54.2	54.2	0.0	0.0	0.0	0.0	42.6	42.6	0.0	255.2	255.2	0.0
230	25NOV79	99.2	99.2	0.0	0.0	0.0	0.0	87.6	87.6	0.0	-24.6	-24.6	0.0
231	02DEC79	-25.5	-25.5	0.0	-2.0	-2.0	0.0	120.0	120.0	0.0	31.5	31.5	0.0
232	09DEC79	1.3	1.3	0.0	-3.4	-3.4	0.0	143.8	143.8	0.0	53.1	53.1	0.0
233	16DEC79	74.7	74.7	0.0	0.0	0.0	0.0	406.9	406.9	0.0	241.8	241.8	0.0
234	23DEC79	0.0	0.0	0.0	15.0	15.0	0.0	114.3	114.3	0.0	137.4	137.4	0.0
235	30DEC79	50.8	50.8	0.0	0.0	0.0	0.0	-50.8	-50.8	0.0	96.9	96.9	0.0
236	06JAN80	-5.6	-5.6	0.0	0.0	0.0	0.0	57.8	57.8	0.0	8.1	5.1	3.0
237	13JAN80	16.8	16.8	0.0	0.0	0.0	0.0	327.8	327.8	0.0	76.1	76.1	0.0
238	20JAN80	50.6	50.0	0.0	5.4	5.4	0.0	290.3	290.3	0.0	128.2	123.1	5.1
239	27JAN80	20.0	20.0	0.0	0.0	0.0	0.0	159.9	159.9	0.0	105.2	105.2	0.0
240	03FEB80	70.0	70.0	0.0	0.0	0.0	0.0	103.6	103.6	0.0	88.4	88.4	0.0
241	10FEB80	24.1	24.1	0.0	10.9	10.9	0.0	464.1	464.1	0.0	114.1	114.1	0.0
242	17FEB80	50.0	50.0	0.0	0.0	0.0	0.0	57.7	57.7	0.0	105.3	105.3	0.0
243	24FEB80	0.0	0.0	0.0	0.0	0.0	0.0	29.9	29.9	0.0	166.0	166.0	0.0
244	02MAR80	30.3	30.3	0.0	0.0	0.0	0.0	5.1	5.1	0.0	67.5	62.4	5.1
245	09MAR80	-62.9	-25.4	-37.5	0.0	0.0	0.0	47.2	47.2	0.0	82.2	82.2	0.0
246	16MAR80	50.8	25.4	25.4	5.4	0.0	5.4	386.0	386.0	0.0	125.9	123.9	2.0
247	23MAR80	58.6	58.6	0.0	5.4	5.4	0.0	229.0	229.0	0.0	56.7	56.7	0.0
248	30MAR80	16.3	-20.0	36.3	21.8	21.8	0.0	174.3	174.3	0.0	-11.2	-26.4	15.2
249	06APR80	19.1	0.0	19.1	32.7	32.7	0.0	106.5	106.5	0.0	35.9	35.9	0.0
250	13APR80	25.9	0.9	25.0	10.8	5.4	5.4	145.8	145.8	0.0	23.2	18.1	5.1
251	20APR80	30.4	25.0	5.4	10.8	5.4	5.4	142.6	142.6	0.0	71.3	70.3	1.0
252	27APR80	47.1	47.1	0.0	0.0	0.0	0.0	243.6	243.6	0.0	107.7	75.7	32.0
253	04MAY80	-85.3	-85.3	0.0	0.0	0.0	0.0	251.5	200.7	50.8	50.8	37.6	13.2
254	11MAY80	14.8	14.8	0.0	0.0	0.0	0.0	28.3	28.3	0.0	65.3	65.3	0.0
255	18MAY80	10.9	-5.4	16.3	0.0	0.0	0.0	37.6	37.6	0.0	53.3	53.3	0.0

PURCHASES FROM FOREIGN SELLERS
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT)
19:04 TUESDAY, SEPTEMBER 22, 1981
SOURCE: USDA EXPORT SALES REPORTING DIV

OBS	WHEATT	WHEATC	WHEATN	BARLT	BARLC	BARLN	CORNT	CORNC	CORN	SOYT	SOYC	SOYN
256	9.2	0.0	9.2	0.0	0.0	0	365.7	365.7	31	153.4	112.8	40.6
257	59.2	59.2	0.0	0.0	0.0	0	227.2	227.2	0	-7.9	-33.3	25.4
258	20.7	20.7	0.0	0.0	0.0	0	-56.4	-56.4	0	79.3	79.3	0.0
259	0.0	0.0	0.0	5.4	5.4	0	-92.8	-92.8	10	62.8	37.4	25.4

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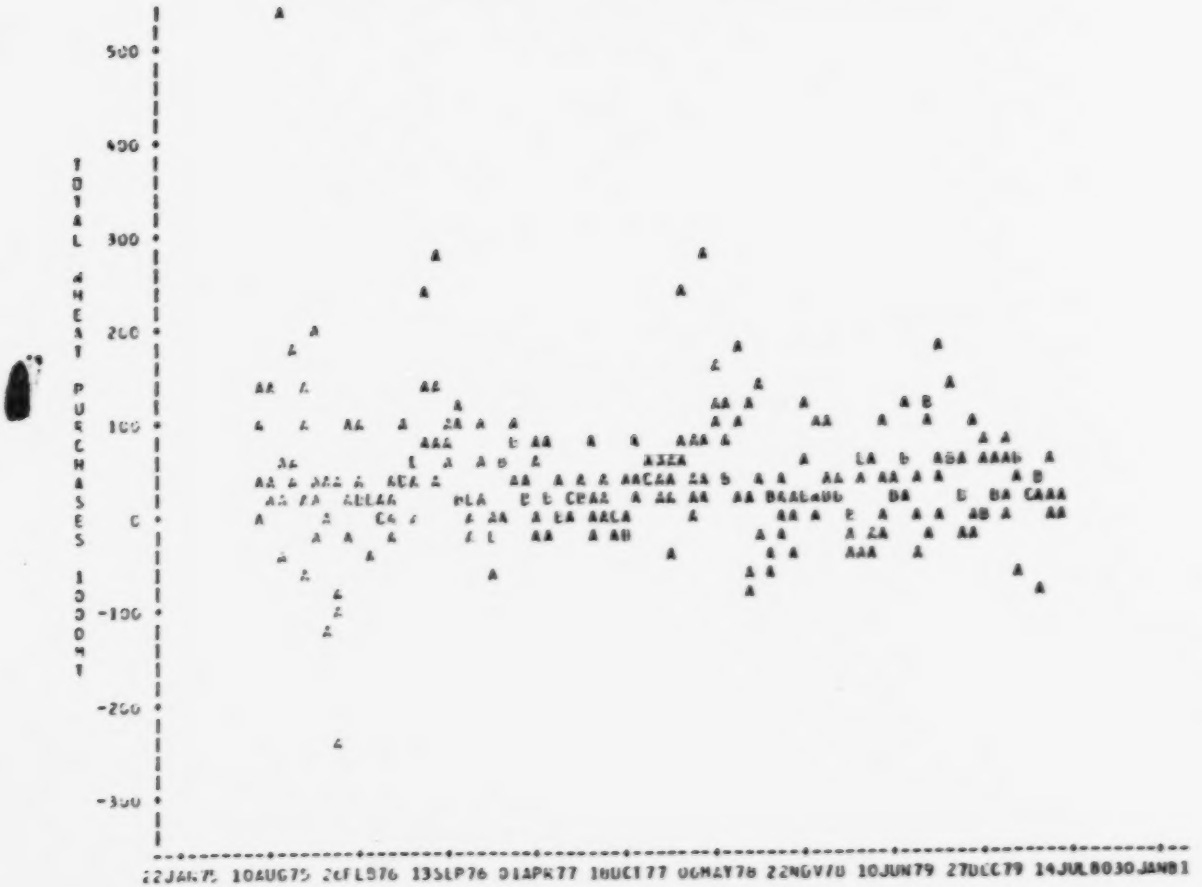
PURCHASES FROM FOREIGN SELLERS 15
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT)
SOURCE: USDA EXPORT SALES REPORTING DIV 14:44 TUESDAY, SEPTEMBER 22, 1981

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
WHEATT	TOTAL WHEAT PURCHASES 100CMT	259	37.10231280	67.2165642	-249.0000000	533.0000000
BARLT	TOTAL BARLEY PURCHASES 100CMT	259	3.7432434	12.3576584	-43.5000000	121.7000000
CORNT	TOTAL CORN PURCHASES 100CMT	255	94.28274510	107.6676005	-185.3000000	617.7000000
SOYT	TOTAL SOYBEAN PURCHASES 100CMT	255	74.65529412	57.2055917	-76.0000000	283.0000000

PURCHASES FROM FOREIGN SELLERS
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT) 14:44 TUESDAY, SEPTEMBER 22, 1981
SOURCE: USDA EXPORT SALES REPORTING DIV

PLOT OF WLATTOWKLND LEGEND: A = 1 OBS, B = 2 OBS, ETC.



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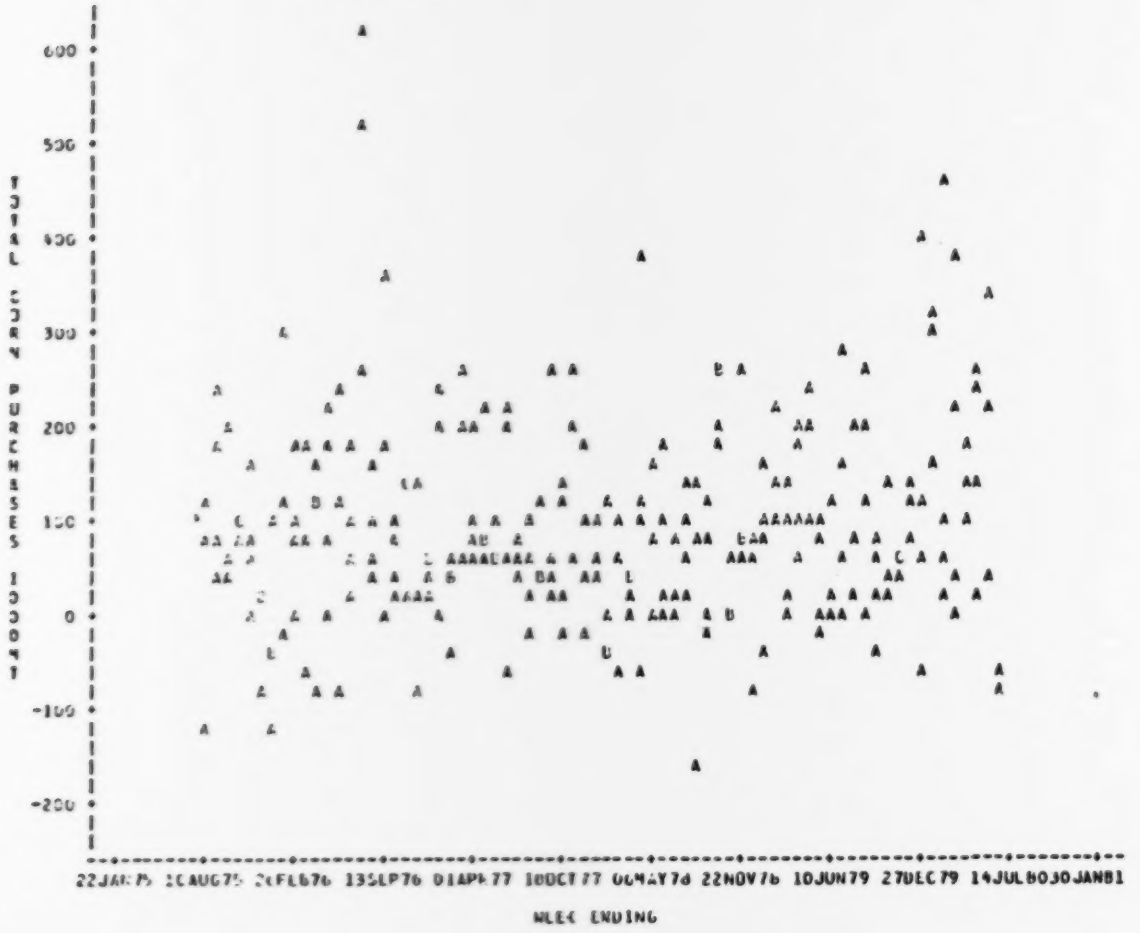
PURCHASES FROM FOREIGN SELLERS
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT)
SOURCE: USDA EXPORT SALES REPORTING DIV

14:44 TUESDAY, SEPTEMBER 22, 1981

PLOT OF BARLEY*WEEK LEGEND: A = 1 OBS, B = 2 OBS, ETC.

PURCHASES FROM FOREIGN SELLERS 7
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT) 14:44 TUESDAY, SEPTEMBER 22, 1981
SOURCE: USDA EXPORT SALES REPORTING DIV
PLOT OF CORNTOTAL LEGEND: A = 1 OBS, B = 2 OBS, ETC.



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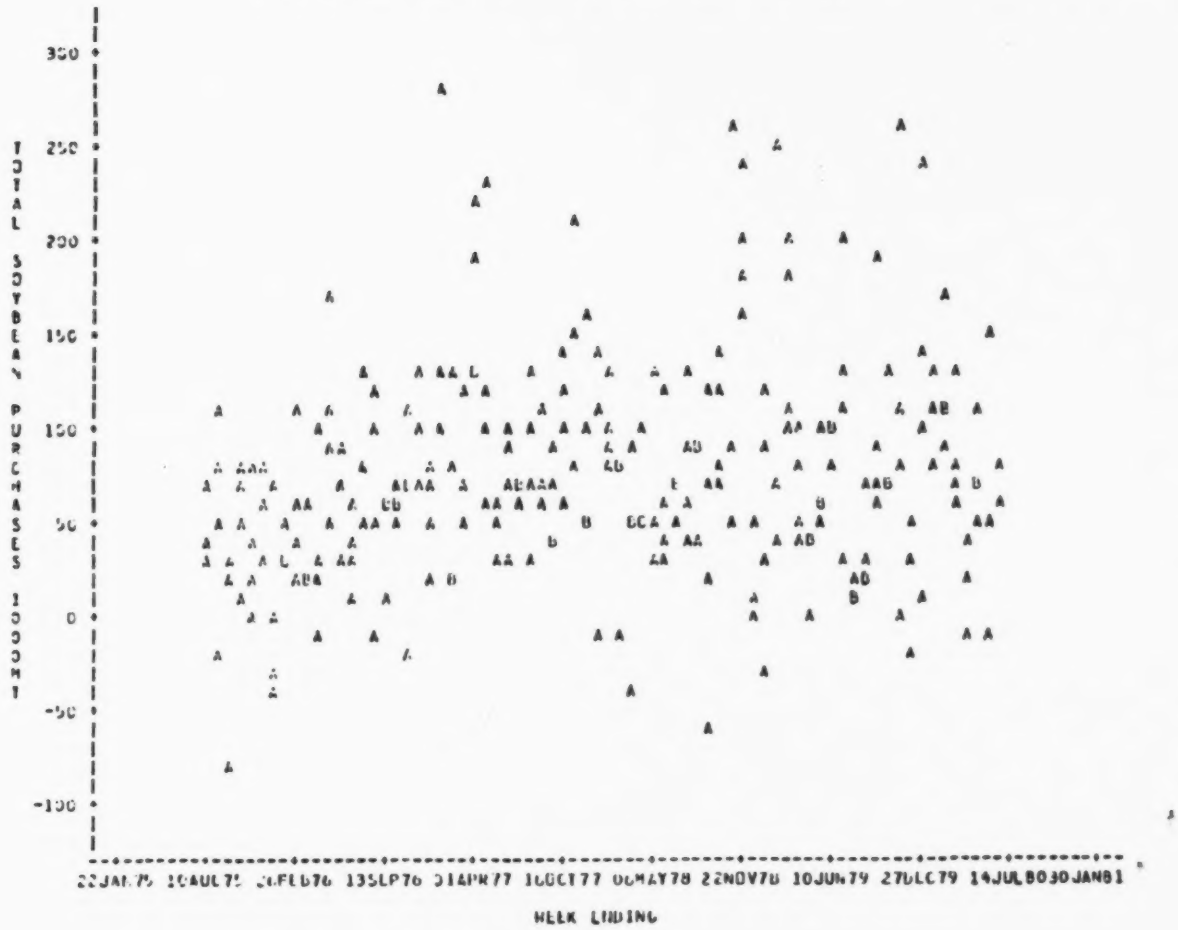
PURCHASES FROM FOREIGN SELLERS
WHEAT CORN AND SOYBEANS 1975 TO 1980
(1000 MT)
SOURCE: USDA EXPORT SALES REPORTING DIV

14:04 TUESDAY, SEPTEMBER 22, 1981

PLOT OF SOYTOTEXP LEGEND: A = 1 OBS, B = 2 OBS, ETC.



APPENDIX 4

CALCULATION OF WEIGHTS AND LAGS FOR SPECTRAL ANALYSIS

The triangular (Bartlett) lag window was used in this analysis with 19 lags. The weights for this lag scheme were calculated using the following formula:

$$W_i = \left[\frac{\text{Sin } (Mfi)}{Mfi}\right]^2$$

Where: $M = 19$ the number of lags

fi = lag frequency = $\frac{\pi}{m} L$

$L = 0, \ldots, 19$

$M = 129 = \frac{N}{2}$

$N = 250$ = number of observations

The bandwidth for this scheme is $\frac{1.5\pi}{.5M} = .496$.

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